SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, APRIL 1, 1904.

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

MEETING OF SECTION E OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND OF THE GEOLOGICAL SOCIETY OF AMERICA.

PAPERS READ BEFORE SECTION E.

An American Geographers Union: WM. M. DAVIS.

There is to-day no geographical society in the United States of organization and rank similar to those of the Geological Society of America. It is believed that the advance of geographical science would be promoted by the organization of a professional society in which only those who have published papers based on original observation should be eligible to membership. A method of beginning the organization of such a society is suggested.

The Concentration of Geographical Publications: ISRAEL C. RUSSELL. (Read by title.)

The immediate welfare and future development of geographical science demand that there shall be a union or concentration of the several journals, proceedings, magazines, etc., now issued by geographical societies in North America, and one well-written, well-edited, well-illustrated and well-printed monthly magazine issued. Some of the advantages of such centralization are:

The convenience of reading or consulting one publication instead of many.

Less expense, as may be judged, of issuing one publication in place of several.

The much less expense to subscribers of one publication instead of ten or more as at present.

The larger audience to be secured by one centralized bureau of publication than by any one

and, as there seems no doubt, all of its component bureaus.

Greater promptness in the publication of results in a monthly magazine than in quarterly, annual or occasional journals, etc., as is now the case in several instances.

A larger and more important audience to be addressed on geographical themes, and hence greater inducement for careful preparation and greater care in writing.

Greater dignity and greater influence of one strong publication than of many, several of which are weak.

The employment of one instead of several editors, thus saving both time and money.

Greater revenues to be expected from advertisements from one widely circulated magazine than in the case of several local journals, etc., as at present, but few of which derive any assistance from this source.

The greater inducements which one widely circulated magazine would have in securing contributions from distinguished investigators, well-known explorers, etc., over a less widely distributed publication.

The probability that the proposed magazine, on account of its increased earning power over that of the several local publications now issued, would be able to pay for leading articles.

Important also is the fact that the concentration of geographical literature in one series of volumes, instead of several independent series as at present, would be conducive to the saving of time and energy on the part of all future generations of geographers who may wish to consult the writings of their predecessors. In order to gain these many and great advantages, geographical societies are asked to relinquish some of their purely local interests and look for compensation for such losses in the wider diffusion of geographical information and a more general awakening to an interest in geographical work.

Fossiliferous Sandstone Dikes in the Eocene of Tennessee and Kentucky: L. C. Glenn.

Fossiliferous sandstone dikes are found to occur in basal Eocene clays in Tennessee and Kentucky. The dikes have no definite orientation. They vary in width from mere stringers to masses several feet in width. The fossils are casts and are of Eocene aspect. The sands filling the fissures are micaceous and are regarded as derived from certain Eocene sands interbedded with the clays. There is no definite evidence as to their mode of origin, but as the region has recently suffered repeated earthquake shocks, it seems probable that it has similarly suffered in the past and that the fissures are of earthquake origin.

The Fauna of the Potter Creek Cave: W. J. Sinclair. Presented by J. C. Merriam. (Illustrated with lantern slides.)

The Potter Creek cave contains fossil remains representing a Quaternary fauna which has heretofore been very imperfectly known. Recent explorations in this and adjacent caves have brought to light over fifty species of mammals and birds. Of this number many forms are new. The paper treats of the occurrence of the remains and the general relationship of the fauna.

Evidence of Recent Differential Movement along the New England Coast: Geo. Carroll Curtis. (Read by title.)

Evidence of change of level of the land in respect to the sea in recent geologic time has been noted by Shaler, De Geer, Stone and Willis. Davis has described a coastal plain of recent origin in the vicinity of Portland. Tarr and Woodworth lately report shore lines on Cape Anne up to eighty feet. A range of earlier shore margins from a few feet above tide in Boston Bay to 1,300 feet or more on Mount Desert has thus been recorded. Detail study within this zone, however, indicates that these movements have not been continuous. On Monhegan Island, ten miles off the middle coast of Maine, there are strongly marked shore lines 160 feet above present sea level, with an amount of wave work in the hard

gabbro rock 40 feet above the present limits of waves, approximating that done at the sea margin of to-day. Glacial drift has apparently been largely removed through wave action. On the lower Matinicus Group, which lies some twenty miles to the eastward, banks of what seems to be glacial drift are now being rapidly cut away by the sea. Had these two groups of islands taken part in the same movements permitting the strong bench cutting in the hard rocks of Monhegan, the preservation of the yielding till has yet to be explained. A suggestion from this evidence is that the recent movements have not been continuous throughout the region.

The Two Classes of Topographic Relief: GEORGE CARROLL CURTIS. (Read by title.)

During the last few years there has been both in this country and in Europe discussion in regard to the 'proper method' for representing the surface of the earth in relief. Some of this discussion has been, it appears, over two distinct kinds of work under a single classification. These two classes, though not yet generally designated by separate terms, are labeled here as Classes I. and II.

CLASS I.

Requisites of Class I.

A miniature or replica of the earth's surface.

A characteristic reproduction of the topographic form.

As to scale; true.

Detail of form; in same proportion as general scale.

Color; consistent with natural laws.

Culture; indicated by the forms which characterize it.

CLASS II.

Attributes of Class II.

An expression of a map in relief.

An arbitrary representation of the topographic form.

As to scale; optional.

Detail of form; according to choice.

Color; any desired scheme or pattern.

Culture; indicated by any method or arbitrary sign which may seem desirable.

While these requirements and attributes cover but a portion of the subject, they may serve to illustrate the principles underlying it. Should Class I. be designated as topographic models and Class II. as relief maps (or by any more appropriate names) Class I. would include poor 'models' and Class II. good 'relief maps.' A poor 'model' would be one which, while attempting to follow the principles governing its class, does so in an unskillful and inexpressive manner. The requirements of a good 'relief map' are more difficult to state since, being of empirical character, based upon standards of choice, the style of relief maps may be subject to changes of fashion. It seems reasonable, however, to assume that the most satisfactory work in Class II. will eventually be based on a thorough understanding of the principles governing Class I.

PAPERS READ BEFORE THE GEOLOGICAL SOCIETY OF AMERICA.

Observations on the Geography and Geology of Western Mexico: OLIVER C. FARRINGTON. (Illustrated by lantern slides.)

This paper describes a journey from Durango westward to Ventanas across the plateau of the western Sierra Madre. The plateau exhibits a comparatively unbroken surface rising gradually from a height of 6,000 feet at Durango to about 9,000 feet farther west. It then slopes toward the Pacific and is deeply dissected by streams. Evidence is adduced to show a rather rapid eastward movement of the divide. The region is for the most part comparatively arid, although on the western edge of the plateau extensive forests occur. The rocks are largely eruptive. The Carro Mercado or 'Iron Mountain' is described in some detail and its origin discussed, as is also an area

of remarkable forms, produced by erosion, known as the 'City of Rocks.'

New Studies in the Ammonoosac District of New Hampshire: C. H. Hitchcock.

For several years the author has been investigating the geology of the only part of New Hampshire which yields fossils, hoping to be able to interpret the mutual relations of the several formations as revealed by paleontology and a better understanding of the petrography. The fossils have been renamed by Mr. Schuchert. (1) The rock masses in this district formerly referred to; porphyritic gneiss, lake gneiss, Bethlehem gneiss, protogene, diorite and hornblendites are now regarded as igneous instead of metamorphic stratified terranes. (2) The fossils belong to the middle upper Silurian. (3) The rocks of Blueberry Mountain exhibit the synclinal structure—consisting in the upward order of limestones, argillite, conglomerate and black argillites. Only the limestones contain fossils. (4) Different ranges of argillite having somewhat diverse petrographical character are now esteemed to be equivalent—the variations being supposed to have been occasioned by a greater or less metamorphic action. (5) Careful scrutiny of the slates reveals both a cleavage different from the stratification, and a structure analogous to stratification produced by a multitude of minute fractures. (6) The areal distribution and stratigraphy of the 'auriferous conglomerate' suggests its identity with the 'Coos quartzite'—a formation traceable southerly into Massachusetts down the Connecticut valley. (7) The numerous fractures in this conglomerate indicate that the whole region is but a mosaic of faulted fragments. (8) This better understanding of the Ammonoosac rocks can not fail to improve our interpretations of the ages of the adjacent crystalline groups in northern New England.

Studies in the Western Finger Lake Region: Charles R. Dryer. (Illustrated with lantern slides.)

The region discussed lies in western New York, between Canandaigua Lake and the Genesee River. The northward slope of the Allegheny plateau is here trenched by deep, narrow valleys, four of which contain small lakes, while a fifth is lakeless. These valleys are similar in general character to those of the larger Finger lakes, but bear peculiar relations to one another and to the east-west Cohocton valley. In several cases the head of a minor valley opens broadly into the side of a major valley but a few hundred feet above its floor, thus sustaining the relations of a headward hanging valley. These are thought to furnish criteria for estimating the amount of differential deepening by ice erosion. The main valley heads are blocked by massive terminal moraines and overwash plains. The steep valley slopes are broken by rock terraces which support well-developed marginal moraines. Pitted or morainal deltas indicate the existence of high-level marginal lakes. Transverse passes and high-level longitudinal valleys are choked for many miles with morainal deposits terminating in an overwash plain. Some of the principal ridges present drumlinoid profile, while their lateral slopes were greatly oversteepened. The phenomena indicate that during the late Wisconsin period the region was occupied by a complex system of distributary and intercepting ice streams, to which the present depths and sharpness of the valleys are chiefly due.

Note on the Geology of the Hellgate Valley between Missoula and Elliston, and Northward to Placid Lake, in Montana: N. H. Winchell. (Read by title.)

This paper gives an account of the general stratigraphy extending from the oldest sediments (Algonkian) to the Cretaceous

and an approximate estimate of the thickness of the various formations. The region is marked by many faults and close folds, the axes mainly running northwest and southeast. The author makes a provisional identification of the Algonkian formations described further north by Willis, viz., the Kintla argillite, the Sheppard quartzite and the Siyeh limestone. The great limestone formation of the region, usually regarded as including the Carboniferous, is believed to extend downward so as to embrace the Devonian and the Trenton of the Lower Silurian. The Jura-Trias, as identified, contains a coal bed that promises to be of economic importance. The igneous phenomena are numerous and diversified, consisting of surface lava sheets, volcanic craters and volcanic ash, as well as dikes of gabbro, diabase, quartz-porphyry and granite. The oldest rocks constitute the highest relief of the country, the Cretaceous strata having been less disturbed, though the Cretaceous is probably older than the epoch of the principal volcanic action. One of the most important statements of the paper is to the effect that there seems to have been a practically continuous sedimentation from the Algonkian to the close of the great (Carboniferous) limestone.

A Fossil Water Fungus in Petrified Wood from Egypt: ALEXIS A. JULIEN. (Read by title.)

A description is given of a specimen of silicified wood from a 'petrified forest' near Cairo, and the mode of distribution of the fungus throughout the ducts. An interesting association of crystals of hematite and of pseudomorphs after gypsum and halite occurs, which testifies to the earlier conditions of petrification. The organic forms have been preserved in remarkable perfection and abundance. These are successively described, comprising discoid spores, an articulated macromycelium, macrosporanges enclosing sporules, micromycelium bearing three forms of stalked cells, and large ovate capsules carrying the spores first described, a continuous series which apparently represents the life history of the new organism. Its generic relationships and genetic local history are then discussed, with a review of various theories of the process of silicification.

The Development and Relationships of the Rugosa (Tetracoralla): J. E. DUERDEN. (Illustrated by lantern slides. Read by title.)

The paper gives (1) a brief historical account of the various theories which have been held with regard to the nature and relationships of the extinct Rugosa or Tetracoralla; (2) the conclusions of the author from the examinations of a large number of species in the light of more recent results on living corals. The present investigation has been carried on mainly by the method of grinding down of individual coralla, each successive stage in the growth being drawn as it appeared. In this way the complete development and relationships of the septa have been established. In every instance where the perfect tip has been preserved a cycle of six septa is found to occur, thus demonstrating the primary hexameral relationships of the Rugosa as contrasted with the tetrameral usually assumed. The subsequent septa appear in only four of the six primary chambers and in a manner differing altogether from that in modern corals. The conclusions reached are that the Rugosa must remain a distinct group of corals, related in their early stage to modern corals and actinians, but later developing in an altogether characteristic manner. Of modern forms they are most closely allied to the zoanthid actinians, which are without any true skeleton; in these the addition of the mesenteries takes place in a manner

comparable with that of the septa in the extinct forms, though proceeding in only two of the six primary chambers.

The Sudbury Nickel-bearing Eruptive: A. P. COLEMAN.

Field work carried on for two summers for the Bureau of Mines of Ontario has proved that the eruptive rock accompanied by nickel ores in the Sudbury District has a continuous outcrop enclosing an oval area forty miles by sixteen in extent, and dipping inwards on all sides. It is in reality a sheet of rock from one to three miles thick forming a boat-shaped basin, but having an eruptive contact with the rocks both above and below. Its outer, lower edge consists of norite and is much more basic than the inner, upper edge, which is a micropegmatite consisting mainly of alkaline feldspars and quartz. The nickel ore bodies are found arranged along the basic, outer edge or on irregular dike-like extensions of the norite which may reach six miles from the main body of the eruptive. One mine contains several million tons of ore. Most of the ore appears to have separated by gravitation from the still molten eruptive, but part has been deposited by circulating waters.

The Widespread Occurrence of Fayalite in Certain Igneous Rocks of Wisconsin: SAMUEL WEIDMAN.

In the central part of Wisconsin, within the area of pre-Cambrian rocks, is a large variety and abundance of igneous rock which intrudes a much older sedimentary series, and, in turn, lies beneath a later sedimentary series. These igneous rocks may be divided into three series; the oldest being rhyolite; the next, diorite, gabbro and peridotite; the latest, granite, quartz-syenite, nepheline, sodalite, and ægerite-syenites, and related rocks. In the last-mentioned series fayalite occurs as a persistent, though minor, constituent. Analysis of the fayalite is given. Also analyses of the rock varieties are given, showing a remarkably low content of magnesia, which does not increase as the content of silica in the series decreases. The alteration of the fayalite is to magnetic iron oxide. A brief account of the general occurrence of fayalite in other places is given. The various principal types of rock from Wisconsin, containing fayalite, with thin sections and photo-micrographs, are exhibited.

Structural Relations of the Granites of North Carolina: THOMAS LEONARD WATSON. (Read by title.)

Describes the occurrence, distribution and petrography of the North Carolina granites, with special reference to their structural and age relations. The numerous dikes of basic igneous rocks penetrating the crystallines of the Carolina Piedmont Plateau region are discussed in their relations to the jointed structure of the enclosing rocks, especially the granites.

Field Work in the Wisconsin Lead and Zinc District: U. S. GRANT.

During the summer of 1903 the Wisconsin Geological and Natural History Survey did some detailed mapping of selected areas in the southwestern portion of the state, which is part of the Upper Mississippi Valley lead and zinc district. In this field work the topographic and geologic mappings were carried on *pari passu* by the same individuals; the field sheets prepared were on the scale of eight inches to the mile, with ten-foot contour interval, and in publication the scale is to be reduced one half. While maps of this scale and detail will be valuable in themselves, it is hoped that they will give important results in working out the details of the relations of the ore bodies to the structure of the district.

Molybdenite at Crown Point, Wash.: A. R. CROOK. (Illustrated with lantern views.)

This locality furnishes the largest amount of molybdenite in the country. Twelve tons were produced in 1902. Mineral is found in fourteen different associations.

Recent Studies in the Physiography of the Ozark Region in Missouri: C. F. MARBUT. (Illustrated with lantern slides.)

Field work in the Ozark region during the past summer has demonstrated the existence of a peneplain lying at a lower level than that of the so-called Cretaceous peneplain of the same region. It is probably the same feature as the one described locally in Barry and Stone counties by Hershey in 1895. This paper describes its character in the south-central part of the Ozark region.

The Physiography and Glaciation of the Western Tian Shan Mountains, Turkestan: W. M. DAVIS and E. HUNTINGTON.

The existing ranges of the Tian Shan Mountains in central Turkestan result from the elevation and greater or less dissection of a more ancient mountain system that had been previously subdued or worn down to small relief over a large area. The elevation of the old-mountain region was accomplished in part with moderate deformation, in part with strong block-faulting. Local glaciation in several successive epochs is clearly recognized.

A System of Keeping the Records of a State Geological Survey: E. R. BUCKLEY.

Two classes of inquiries are received by a state geological survey, viz., (1) The mineral resources of a particular section of land and (2) the occurrence of a certain resource in a particular county. To answer these inquiries requires the collection and storing of a vast amount of information. The collecting of this information is gradually carried on by the usual field work of the survey and correspondence. The storing of this information in such a manner as to make it easily accessible is brought about by an adoption of the card catalogue system. A location case and a subject case are provided in which all data relating to the mineral resources of the state are recorded.

The Tectonic Geography of Southwestern New England and Southeastern New York: WILLIAM HERBERT HOBBS. (Illustrated with lantern slides.)

The paper discusses the important elements in the architecture of the earth's crust within the province designated, as a result of extensive surveys made for the U. S. Geological Survey. A number of 'key areas' were selected having regard both to the intricacy of their structure and to their distribution within the province, and studied with much detail. The structural elements characteristic of the individual areas were then compared and their relationship to the broader structural lines of the province as a whole considered. So far as possible the essential facts were set forth by means of maps projected upon the screen.

The Lineaments of the Eastern United States: WILLIAM HERBERT HOBBS. (Illustrated with lantern slides.)

This paper is an extension of the investigation upon the tectonic geography of portions of New England and vicinity, with a view to determining whether structures found to characterize that province are common to the larger regions as well. The materials of the study have been the topographic maps of this region and the published works of other geologists, the methods of examination and the point of view being, however, new.

A Pre-glacial Peneplain in the Driftless Area: U. S. Grant and H. F. Bain.

In southwestern Wisconsin and adjacent portions of Illinois and Iowa is a well-developed peneplain cutting across part of the Maquoketa shales, the whole of the Galena, Trenton, St. Peter and Lower Magnesian, and terminating to the north in a sharp scarp developed in the soft Potsdam sandstone. It rises gradually to the north. Above it are the so-called 'mounds' capped with Niagara limestone and forming monadnocks left in the dissection of an older peneplain. Below it the streams have cut valleys with sides of simple continuous slope. The valleys are arranged in normal dendritic fashion. Streams heading outside the area show terraces of glacial-derived material and their tributaries show commonly a low terrace developed by silting up of slack water. The peneplain represents the last great period of base-leveling before the oncoming of the glaciers. It was followed by one of sharp downward stream-cutting which continued apparently with but slight interruption through the Pleistocene to the present. Possible correlation of the peneplain with a similar one of Tertiary age in southern Illinois is discussed.

The New Cone of Mont Pelé and Other New Features of the Mountain: E. O. Hovey.

Some Striking Erosion Phenomena Observed on the Islands of St. Vincent and Martinique in 1903: E. O. Hovey.

The two papers announced in the above titles are essentially an exhibition of lantern slides illustrating facts brought out in recent publications.

The Grand Soufrière of Guadaloupe: E. O. Hovey.

This paper emphasizes by means of lantern views the idea that this cone has been formed in the same way as that of Mont Pelé.

Domes and Dome Structure in the High Sierra: G. K. Gilbert. (Illustrated with lantern views.)

In many dome-like granite hills the rock is divided into plates by curved joints approximately parallel to the surface. Some observers call the structure exfoliation, others regard it as an original structure of the granite. Under one view the surface forms determine the structure; under the other the structure determines the surface forms. A study of the High Sierra of California in the summer of 1903 has led the author to accept the former view, and to believe that the forms of the parting planes are conditioned by the forms of the topography. As to the cause of the phenomenon, the following hypothesis is advanced: Formed deep within crust, the granite was initially subject to compressive stress, which was balanced by internal expansive stress. As the unloading involved in subsequent denudation reduced the compressive stress, the unbalanced expansive stress caused strains which eventually resulted in exfoliation.

The Trent River System and the St. Lawrence Outlet: Alfred W. G. Wilson. (Read by title.)

The St. Lawrence River in the vicinity of the Thousand Islands crosses the Frontenac axis, a narrow neck of Archean rocks which connects the Adirondack region with the greater Archean areas of Canada. West of this axis, the country which lies to the north and east of Lake Ontario is underlain by flat-lying, Ordovician rocks, chiefly Trenton limestones. The drift cover of the area is very thin, averaging perhaps two feet in depth, while the relief has an average measure of at least one hundred and fifty feet. There are numerous areas where the bed-rock exposures are very ex-

tensive. In its present attitude the region is traversed by a number of southwest-flowing streams, running in broad, deep, rock-sided valleys. These valleys are older than the ice sheet which made the grooves on the bed-rock, and there is internal evidence to show that the amount of glacial erosion within the area has been very slight. The maturity of form, and the adjustments of these valleys, where they are not submerged beneath the waters of the present lake or obscured by morainic deposits, are regarded as indicating that they were eroded by the preglacial predecessors of the streams which flow in them. The form and adjustments of the valleys of the partly submerged portions of the limestone areas, particularly the Bay of Quinte and the present St. Lawrence outlet, suggest that these also are similar to those unsubmerged valleys which can be more readily and easily studied. It is concluded that these rock-sided valleys formed part of a now dismembered river system whose original general direction of flow was southwest; that the Trent River system occupies parts of no less than twenty of the tributary valleys of this system; and that the present St. Lawrence outlet from Lake Ontario, west of the Frontenac axis, consists of a complex of three of these ancient valleys in which the water is now flowing in a contrary direction to that in which it was flowing when the valleys were carved.

Postglacial Changes of Attitude in the Italian and Swiss Lakes: FRANK BURSLEY TAYLOR. (Read by title.)

In the summer of 1894 the writer spent two weeks in exploring the shores of the lakes of northern Italy for evidences of change in the relative attitude of the lakes and the land. On Lakes Maggiore and Como no certain evidence of wave action was found above present lake level. But a study of the old deltas of the numerous torrents which descend from the mountains shows that the lakes formerly stood in different attitudes, with reference to the land, from those in which they stand to-day; and Lake Maggiore stood at a slightly higher level. The old deltas are fragmentary, but their form and structure show the former lake level with approximate accuracy. Since the change of attitude the streams have cut down to the present level and some of the larger torrents have well-formed valley terraces connecting with their old deltas and standing high above their modern floods. In the northern part of Lake Maggiore fine examples may be seen at Macagno on the east side and at Conobbio on the west. The valley terrace back of Conobbio is a well-marked feature. At Arona and Meina near the south end, the old lake level was nearly 20 feet above the present level, and it rises gradually to 50 or 55 feet near Locarno at the extreme north. The Ticino River below Lake Maggiore seems to have cut down the morainic barrier nearly 20 feet since the change of attitude. On Lake Como the old lake level at Cernobbio on the west side near the south end appears to be about the same as the present level and rises northward to 30 or 35 feet at Gravedona. On Lake Garda, along the western side of the southern part, a small but well-defined wave-cut beach was found descending from the eastern end of the peninsula southeast of Salo, where it is about 15 feet above the present lake level, very nearly to the present level at Desenzano. It is also well shown on the outer end of the peninsula near Sermione and on Isola di S. Biagio and other small islands. The east side of the expanded portion of the lake was not explored. In the narrower northern part there are deltas near Riva like those of Lake Maggiore, and a few also along the eastern side. These seem to indicate a former lake level at the north end 30 or 35 feet higher than the

present. Thus, on each of the three lakes there are remains of an old lake surface which rises in a northerly direction about one foot per mile as compared with the modern surface. Lake Geneva in Switzerland was also studied for the same evidences. Sandy deposits apparently marking an old beach were found at Lausanne 12 to 14 feet above the present lake level. The paper then discusses briefly the significance of these facts and of similar facts in other parts of the world.

The Basin of the Po River: George L. Collie. (Read by title.)

The paper is the result of field work done on the Po plain in the spring of 1903. The basin of the Po was an arm of the sea during the Miocene; a portion of the time probably a strait connecting the Adriatic with the Mediterranean, through the present Col d'Altare. The sea was gradually crowded out by the encroachment of sediments, brought in from the Alps to the north and from the Apennines to the south. Sediments from Alpine sources are coarse; from Apennine sources, fine. The total area of the basin is 27,000 square miles, of which 16,000 square miles are mountainous and 11,000 square miles belongs to the plain of the Po. Borings in the plain show that it is composed of a series of approximately horizontal sands, clays and marsh deposits, the last including lignitiferous clays. The sands contain marine shells, the clays carry land shells. The whole succession indicates alternation of marine, fresh-water and land conditions. The thickness of the deposits ranges from 572 to 695 feet. There is little fine alluvium in the upper Po, the river flowing over coarse deposits; but below the Sisera River alluvium of a fine type is common. The upper Po is everywhere crowded close to the northern spur of the Apennines, forced over apparently by the large and heavily laden tributaries from the Alps. In times of flood the river carries an immense amount of debris, estimated to be one three-hundredth of its volume. In spite of this heavy load, the river is not aggrading its bed to an appreciable extent. This non-aggradation is due in large measure to the lake system of northern Italy, which drains into the Po and supplies it with four tenths of its water content. During periods of high water in the fall and spring, the sediment-laden streams from the Alps bring their load to the Po and deposit it. The lakes, however, being basins of reception, not only take out the sediments from the drainage, but also store the water and supply it more gradually than do the lakeless streams. Lago di Garda, in time of great rainfall, scarcely changes its level; the small lakes, such as Como or Maggiore, show great changes of level within a few hours, but, on the whole, they all tend to restrain the water. The result is that after the debris-laden streams have deposited their sediments in the Po and temporarily raised its bed, later there comes a volume of comparatively clear water which removes the previous accumulations, and an equilibrium is maintained on the whole. The Po is thoroughly diked from Cremona to the marshes of the delta. It is customary to place the froldo or main dikes at some distance from the river, thus allowing the river to overflow the intermediate flood plain or golene for some distance before reaching the dikes. The golene are frequently covered with willows and thick underbrush and the velocity of the current is greatly reduced thereby and there is little active erosion upon the dike itself. The dikes are continually being extended; the extension of dikes accounts in a measure for the rapid extension of the delta in modern times. Between 1200 and 1600 A. D. the delta advanced on the average about 70 feet annually; for the last few

decades, its advance has been at the rate of about 200 feet annually. The flood plain deposits of the upper Po are cross bedded and very irregular; the beds are chiefly cobbles, coarse gravel and pebbles; occasionally wedges of sand are thrust in, the latter of limited extent. The beds show great variations in size of materials; there are sudden changes from coarse to fine gravel, and *vice versa*. The beds are not continuous over wide areas; generally there is a change in composition and texture every few rods. Occasionally there are local deposits of silt and clay, stratified as a rule, which cover a few acres. One of these deposits in the environs of Turin covers forty acres. On the lower Po the flood plain deposits are much finer in texture and show more regular arrangement than those quoted above. Much of the material is silty clay and fine sand. Laminated structure is common, the thin laminæ extending for several hundred feet, but invariably replaced sooner or later by sediments of different texture or composition. When long sections are exposed so that they can be seen *ensemble*, it is noticeable that the beds undulate. Strictly speaking, there is no horizontality of beds, but rather a slow rise and fall. Long, flat augen of sand are the apparent cause of this arrangement. These flat lenses occur frequently, the finer sediments wrap them about, and the bedding of the latter is made to show corresponding undulations. The degree of undulation is determined by the thickness and length of the sand lenses.

Nantucket Shore Lines, II.: F. P. GULLIVER. (Illustrated with lantern views.)

During the past year the writer has continued his studies of the recent changes in the shore lines of the island of Nantucket, and the results of such study are given in this paper. Details of changes are presented in the following areas: Great Point, Coskata, Haulover Break, Surfside, Maddaket, Smith Point, Brant Point, Nantucket Harbor and Coatue. Original plane table surveys are given of Miacomet foreland, at Surfside, where sand has been built out some 1,500 feet in the last forty years in one of the most exposed portions of the island, while extensive cutting back has taken place both east and west of this foreland; and also of Smith Pond, where the shore line is rapidly moving to the north. Since the break was made in the tombolo at the head of the harbor connecting Coskata Island with the eastern end of Nantucket, in the winter of 1896–7, at the point where the fishermen formerly hauled their boats over the sand, there have been many changes in the shore lines. The facts in regard to these changes have been collected from government surveys and many private sources, and a series of outline maps prepared.

The New Geology under the New Hypothesis of Earth Origin: HERMAN L. FAIRCHILD.

A theoretical discussion of the geologic bearings of the planetessimal hypothesis. A brief comparison is made between the two conceptions of earth genesis, and it is shown how the nebular hypothesis has failed to explain phenomena and has been a hindrance to the progress of geologic science. Some of the topics discussed are, origin of the atmosphere, origin of the ocean, volcanic phenomena, source of hydrocarbons, geologic climates, diastrophic movements, life on the earth.

The Humboldt Region; a Study in Basin Range Structure: G. D. LOUDERBACK.

Glacial Erosion in the Finger Lake Region, New York: M. R. CAMPBELL. (Read by title.)

The Finger Lake region of New York is an ideal field for the study of the effect of glacial erosion, presenting as it does simple

geologic conditions free from complicated structure and possessing fairly well-marked topographic forms from which its physiographic history may be interpreted. The present paper is the result of an effort to make a systematic study of the physiographic features of this part of the state, and it is based largely upon a careful study of the contoured topographic maps that have been assembled and reproduced here for the first time. The author has approached the question free from any bias regarding the ability of glaciers to accomplish extensive erosion, and has dealt with the problem entirely from the physiographic standpoint; an effort was made first to account for the present topography largely through the simple process of subaerial erosion, but this failed to explain the peculiar features of the region. The conclusion arrived at is that ice was the principal agent in not only giving the finishing touches to the present topography, but in the extensive erosion which has reduced this portion of the state from an altitude of approximately 2,000 feet to that of 800 or 1,000 feet above sea level, and that has produced the great topographic embayment of the Finger Lake region.

Evidences of Slight Glacial Erosion in Western New York: H. L. Fairchild.

Waning of the Glaciers of the Alps: H. L. Fairchild.

Lantern views from photographs taken during the past summer illustrating the decrease of the Alpine glaciers within recent years.

The Carboniferous of the Appalachian Basin; Part II., the Pottsville: J. J. Stevenson. (Read by title.)

Notes on the Deposition of the Appalachian Pottsville: David White.

General view of the thickness and present distribution of the main divisions of the Pottsville sediments in the Appalachian trough. Extent and duration of the basal uniformity as indicated by fossil plants. Suggestions as to conditions of deposition of the several divisions.

The Benton Formation in Eastern South Dakota: J. E. Todd.

Further Studies of Ozark Stratigraphy: C. F. Marbut.

During the past summer the reconnoissance mapping of the formations of the Ozark Series was extended over the south-central counties of the state. The paper will describe the character and distribution of the various formations, and discuss briefly the evidence on which the correlation is based.

The Iroquois Beach in Ontario: A. P. Coleman.

The detailed mapping of the Iroquois Beach in Ontario was begun in 1898 and practically completed in 1902, but publication was delayed in hopes of extending the work northeast from Havelock, the last point at which the beach could be found. As it can be traced no farther, it is probable that the shore to the east and north consisted of ice. The highest point reached is 498 feet above Ontario or 744 feet above the sea. Northeast of Colborn it is split up into several beaches, in one case the highest being 80 feet above the lowest; but southwest to Hamilton the beach is practically a unit, and the same is true on the south shore to Niagara River. There is evidence of the splitting up of the water levels at Toronto and Hamilton in the form of old surfaces of erosion, soils with trees, and remains of mammoth, etc., at levels from 30 to 80 feet below the gravel bars representing the latest Iroquois lake levels. It is believed that the evidence obtained proves that the Iroquois water was a lake with an ice barrier to the northeast, and not an arm of the sea.

Evidence of the Agency of Water in the Distribution of the Loess in the Missouri Valley: GEORGE FREDERICK WRIGHT.

The paper is the result of field work conducted during the past year in the vicinity of the Missouri between St. Joseph and St. Louis. The direct evidence of the agency of water in distributing the loess is found: (1) in the relations of the loess to the main valleys of the Missouri and its larger tributaries; (2) the existence of distinct laminæ, at a height of 180 feet above the river at St. Joseph, which are very clearly of water origin; (3) the new light shed upon the glacial occupation of the region by the discovery of northern drift on the south side of the Missouri River forty miles beyond the boundary which has heretofore been assigned to it; (4) considerations which show the doubtful character of the conclusions drawn from the fossil shells found in the loess; (5) calculations showing the reasonableness of the supposition that at the close of the Iowan stage of the glacial period there were periodical floods each summer sufficient to cover the whole region occupied by the great body of the loess, and the presentation of a theory that would seem to harmonize all the facts.

The Loess at St. Joseph. (Illustrated by lantern slides.) Read by Professor G. Frederick Wright for Luella Agnes Owen.

Exposures of undisturbed loess in cuts at a variety of elevations are described. Several of the highest are distinctly stratified and the horizontal strata, in places, regularly banded with iron stain. Fossil snail shells of the two forms common to the loess are abundantly distributed throughout these high-level laminations. The iron bands can be accounted for by aqueous deposition, but the æolian theory does not so readily offer a solution of their presence and regularity. Objection to the glacial origin of loess has depended largely for support on the absence of an adequate barrier on the south and west to have retained a body of water of sufficient depth for the deposition of the higher portions of the bluffs. Such a barrier, however, can be shown to have existed and to still remain, by giving attention to the elevations of the tributary water-sheds in those directions and to the known conditions during the flood period in May of 1903. Authority is quoted to the effect that snails can not be identified by the shells alone, as the same kind may be common to forms of radically different organization; and the shell, therefore, is entirely subordinate to differences in structure of the animal. If this is true, the æolian theory suffers the loss of its best support.

Fresh-water Shells in the Loess: B. SHIMEK.

1. A review of the available literature in which reference is made to the occurrence of fresh-water shells in the American loess, with a discussion of the significance and weight of such testimony, showing that as yet no well-authenticated cases of the occurrence of fluviatile shells, at least in original loess, are known.

2. A statement of the author's own experience in the study of loess mollusks, which shows that land shells greatly predominate, and that only such fresh-water forms as inhabit temporary small ponds and streamlets occur in the loess, and these in relatively small numbers.

Comparison of the Stratigraphy of Black Hills, Big Horn Mountains, and Rocky Mountains, Front Range: N. H. DARTON. (Read by title.)

GEORGE B. SHATTUCK,
Secretary.

JOHNS HOPKINS UNIVERSITY.

THE METRIC SYSTEM.

In the current issue of SCIENCE (March 4) Mr. Alfred C. Lane has presented some useful hints with a view to facilitating the popular adoption of the metric system in America. His chief points are the adoption of the metric ton as the standard of mass, the definition of the standard pint as the volume of a half-kilogram of water under standard conditions, and the definition of the foot as the length of the edge of a cube whose capacity is 62.5 pints. This last definition is said, in an appended note, to be not essential to the scheme.

In any system of metrology the unit of length is that to which all other units are finally referred, unless these are so arbitrary as to preclude the use of the word 'system.' The essentials of any desirable system are simplicity and consistency. An ideal system is that developed a century ago in France and now employed by all scientific workers, but not yet popular with the masses in English-speaking countries. The problem of conferring popularity upon it is one that will require many years yet for its solution.

Whatever may be the form taken by legislation in England and the United States, the people can not be compelled to adopt nomenclature that is thrust upon them as a substitute for that to which they have always been accustomed. The nomenclature must be simple in order to secure adoption; it must be at least fairly in harmony with old customs in order to win favor. For many centuries past the foot has been by far the most popular unit of length, though the range of variation in its value has been 165 per cent. of the smallest magnitude to which the name was applied. In like manner the pound has been the popular unit of weight, with as many as 235 variations in value. The use of these names in different languages is popularly maintained, even in countries, like France and Germany, where the metric system is legally established.

If the metric system is ever to become popular in the United States it must be through the medium of such legislation as will give us its substance with as little as possible of its nomenclature. Its essential features are:

1. A decimal relation between all the units employed.

2. A direct and simple relation between units of length and mass.

In view of the strong influence of old customs we can not expect a new system to be inaugurated that is exclusively decimal. If the people are accustomed to binary or duodecimal subdivision they will hold to it in spite of legislation. All of us are disposed to do what we find easiest. Nor is there much reason to expect that all units of length and mass will be discarded except those connected by the simplest relation. Ideas may differ as to what is simplest, and in any case there will be a survival of what the populace finds fittest, irrespective of the prescriptions of theory. The introduction of the metric system can be accomplished only by some sort of compromise, through which old names may be retained while the values of the corresponding magnitudes are slightly modified for the sake of simplicity.

Everybody understands that by a process of selection the once chaotic British system has been becoming simpler. Many units that were in use a half century ago are now obsolete, though the inconvenient relation between those still surviving is bad enough and incapable of much improvement. By still further excision, by adoption of a few names and values from the metric system, and by such modification in existing values as will produce no great inconvenience, we may quite reasonably hope for such practical adoption of a decimal system as to

satisfy all the demands of international commerce.

It should be remembered that by act of congress, April 5, 1893, the international standard meter and kilogram were adopted as the standards of length and mass, respectively, for the United States. The yard and the pound are now legally defined as merely definite fractions of the meter and the kilogram. The following outline of an American system of metrology has occurred to me as perhaps capable of adoption. Some, if not all, of its features must have occurred to many of the advocates of metric reform.

1. Let the length of the yard be changed by legal enactment so as to coincide with that of the standard meter.

2. Let the foot be defined as the fourth part, instead of the third, of a yard. Let it be divided into ten instead of twelve inches. The length of the inch will thus be changed by less than two per cent.

3. Let the pound be defined legally as one half of a kilogram.

4. Let the quart be defined legally as the volume of a kilogram of water under the usual standard conditions. The quart and the liter become thus identified.

5. Let the ton be defined as 1,000 kilograms. The American and metric tons are thus identified.

6. Let the pint, gallon, peck and bushel be retained as secondary units, each being defined in terms of the quart.

The latter part of this scheme, it will be observed, is identical with a part of that proposed by Mr. Lane, but the first part differs quite radically from his. The following tabulation constitutes a summary for measures of length, mass and capacity, respectively.

UNITS OF LENGTH.

1 meter	= 1 yard	= 100	centimeters	= 1,000	millimeters.		
1 inch	= 1/40 yard	= 2.5	"	= 25	"		
1 foot	= 10 inches	= 25	"				

UNITS OF MASS.

1 kilogram	= 1,000 grams.		
1 pound	= ½ kilogram	= 500 grams.	
1 ton	= 1,000 kilograms	= 2,000 pounds.	

UNITS OF CAPACITY.

1 liter	= 1 quart	= volume of	1 kilogram	of water.				
1 pint	= ½ "	= "	"	1 pound	"	"		
1 gallon	= 4 quarts	= "	"	8 pounds	"	"		
1 peck	= 8 "	= "	"	16 "	"	"		
1 bushel	= 32 "	= "	"	64 "	"	"		

This table includes about all of the units needed for most of our measurement. Units of area and volume need no definition. For land measure the mile as unit of length and the acre as unit of area will probably last many years yet. They have no place in international commerce, the needs of which constitute the most important ground for changing the units hitherto in use. No mere theoretic consideration will be apt to influence legislation.

The scheme just outlined presents the advantages of both the decimal and the binary systems of subdivision. In practise halves and quarters are much the most important of the binary subdivisions. In our decimal system of American money the only sudivisions of the dollar that now survive are the half, quarter, tenth, twentieth and hundredth; though eighths and sixteenths seem to have been once coined, and were found more confusing than useful. The division of the foot into tenths rather than twelfths is in accordance with custom now well established among engineers and surveyors. The binary subdivision of the inch may be retained as long as found useful, while the centimeter will be divided into both halves and tenths.

It will be noticed that while some of the secondary British units are retained, especially those with binary relation to the primary unit, the ounce, dram, pennyweight, scruple and grain are all discarded. There has been but little use for these outside of the pharmacy and the mint. The retail dealer uses halves and quarters of a pound. All educated pharmacists to-day

have learned the metric system. They need no weights but the gram with its decimal multiples and divisions. The ounce ought long ago to have been abolished or defined as a definite fraction of the avoirdupois pound alone. Its abolition is much preferable to its retention.

An obvious advantage of dividing the foot into 10 inches is that a cubic foot becomes 1,000 instead of 1,728 cubic inches. The weight of the cubic foot of water becomes 31.25 pounds according to the suggested definition of the pound. The reduction in length to 10 inches, furthermore, makes it coincide very closely with the length of the average masculine foot, while 12 inches is more than twenty per cent. too long.

The suggested length of the inch is between one per cent. and two per cent. less than that of the present inch. Small as this change may be, it constitutes the most serious of all the changes suggested. The practical standard of length in the United States has been, not the yard or foot, but the inch. In the construction and use of all machinery inches and fractions of an inch are the units of measurement. If a screw-thread has been cut in accordance with a gauge based on the inch, a change of two per cent. in the inch would render such a screw worthless for the same machine. The mechanical engineers and machine manufacturers will, therefore, continue to be the most determined enemies of metric reform. Should legislation be adopted involving a change of standards, a generous allowance of time ought to be provided, within which the machinists may adapt new instruments to the new standards. Few, if any, machines can be expected to continue available more than ten years. Such a period of grace would, perhaps, be as much as could be reasonably demanded.

The pound equal to half a kilogram is about one tenth greater than the avoirdupois pound. It is identical with the German *pfund* and the French *livre*. Its adoption by England and the United States would make the pound a definite unit readily understood throughout most of the civilized world. It is now indefinite.

Assigning the qualifier 'metric' to the proposed units to distinguish them from the old ones now in use in the United States, their mutual relations are approximately shown in the following table:

1	metric yard	= 1.0936	old yard.
1	" foot	= 0.8202	" foot.
1	" inch	= 0.9842	" inch.
1	" pound	= 1.1023	" pound.
1	" ton	= 0.9845	" long ton.
1	" quart	= 1.0567	" wine quart.
1	" pint	= 1.0567	" wine pint.
1	" gallon	= 1.0567	" wine gallon.
1	" peck	= 0.9081	" peck.
1	" bushel	= 0.9081	" bushel.

It is, of course, understood that the proposer of any change whatever in the units to which the American public is accustomed will be adversely criticized, particularly by the mechanical engineers and the manufacturers of machine tools. Such criticism can be borne with equanimity if the compromise scheme just outlined should lead to the practical adoption of the metric standards and the decimal system of weights and measures, with a reasonable combination of the binary system with it. The decimal system of coinage a century ago was regarded by some critics as visionary, but it has stood the test of time.

W. LeConte Stevens.
Washington and Lee University.

THE AUSTRALASIAN ASSOCIATION.

The biennial meeting of the Australasian Association for the Advancement of Science was held this year at Dunedin, New Zealand. There was a large attendance of members from all the Australasian colonies

and the efforts of the general secretary, Mr. G. M. Thomson and his committee resulted in a highly successful gathering. The arrangements were satisfactory to the visitors, who were well entertained by the resident members and other citizens.

The generous action of the New Zealand government in granting free railway passes to all visiting members was probably in part responsible for the large attendance.

The address of the president, Professor T. W. Edgeworth David, was delivered on Wednesday, January 6, and the meeting was not concluded until January 13. In his address the president reviewed before a large audience the general advance of all branches of science in southern lands. He strongly encouraged those who are at present engaged in scientific work to redouble their efforts and pleaded that the minds of the young might be so trained in the colonial schools that they may be capable and eager to take up research work in their turn.

On the following day the members were divided into the following sections: A, Astronomy, Mathematics and Physics; B, Chemistry; C, Geology; D, Biology; E, Geography; F, Anthropology; G1, Social Science; G2, Agriculture; H, Architecture and Mining; I, Sanitary Science; J, Mental Science and Education.

The president's address in Section A was an able summary of some recent advances in the theory of the ionization of gases. Professor Brogy, of Adelaide, dealt with his subject in such a manner as to keep his large audience thoroughly interested throughout. On the following day an interesting discussion took place on tidal observation and it was pointed out that New Zealand occupied a very favorable position for such observations. Many other papers were contributed, including one from Professor Rutherford, of Montreal, on the heating effect of radium emanations.

In Section B the president, Mr. Henderson, gave an address on 'Chemistry and Food,' dealing particularly with the adulteration most frequently found in ordinary food substances. Amongst the papers was an interesting research on the acids contained in the resins of some of the New Zealand coniferæ by Professor Easterfield.

Mr. Twelvetrees in his presidential address to Section C dealt with 'Some Aspects of Modern Petrology.' The present confused state of petrological classification was particularly discussed and the president stated that though all systems hitherto proposed had glaring defects he could not believe that the new classification lately proposed in America would be the one finally adopted. Mr. Andrews described some of the glacial features of southern New Zealand, dealing with them in the manner so ably initiated by Professor Davis. Dr. Marshall read a paper on some of the highly interesting alkaline rocks near Dunedin. Some committees' reports were read on 'Glacial Phenomena in Australasia' and important structural features in Australasia and on the possibility of a uniform system of nomenclature in petrology. In the last there were as many divergent views as members.

In Section D the president dealt with the avifauna of Australasia, Polynesia and Austro-Malaya. Amongst many interesting papers were Dr. Chilton's on 'Subterranean Crustacea of New Zealand'; Dr. Fulton's on the habits of the long-tailed cuckoo and Mr. Steads's studies of New Zealand bird life. The nesting habits of these were dealt with in many beautiful photographs.

Anthropology in Section E opened with an address by Professor Baldwin Spencer on 'Totemism in the Central Australasian Tribes.' This was listened to with marked attention even by members who were not otherwise specially interested in anthro-

pology. Other papers were read on Maori folk-lore and studies on various southern languages.

'The Influence of the Southern Ocean on Australasian Climates' was the presidential address of Professor Gregory in the geography section. The effect of oceanic circulation upon weather conditions and the occurrence of weather cycles were the two points most strongly insisted on. Mr. Bowen gave a highly interesting account of the work of the *Discovery* in the South Seas, illustrating his remarks by lantern slides prepared from photographs taken by the expedition.

Agriculture in Section G2 dealt with highly practical matters. The president, Mr. Cato, chose for his subject 'Pomology.' Mr. Gilruth read an important paper on 'The Effect of Injection of Non-pathogenic Cultures with Virulent Ones of Anthrax.' He showed that the anthrax was under certain conditions rendered quite innocuous by this means.

In the architectural section the president, Mr. Deane, dealt with 'Day Laborers on Government Works.' This attracted much attention because of the many instances of colonial governments doing their own contracting.

In the sanitary science section Dr. Tidswell, in dealing with the hygienic action of boric acid, spoke strongly of the deleterious effect that this acid has even when used in small quantities as a preservative of dairy produce.

The education section was the best attended and a larger number of papers was presented to it than to any other section. The discussions evoked in many cases were animated. The president dealt with elementary education in Queensland, and there were papers on the teaching of modern languages, mathematics, geography, etc., and the discussions will probably do much towards the adoption of modern educational methods in Australasia.

Besides the formal meetings of members the association had provided numerous excursions to the many points of scenic or scientific interest in the neighborhood of Dunedin. The botanists were much interested in the abundance of the endemic New Zealand flora still to be found near the town. The geologists viewed and collected from the outcrops of the rare and peculiar alkaline rocks that occur in the Otago Peninsula in such profusion.

Several of the leading citizens of the town entertained the visitors by drives into the country and at afternoon parties at their residences and enabled the workers in various branches of science to meet in social intercourse.

P. Marshall.

Otago University.

SCIENTIFIC BOOKS.

Aboriginal American Basketry: Studies in a Textile Art Without Machinery. By Otis Tufton Mason. From the Report of the U. S. National Museum for 1902, pp. 171–548, with 248 plates. Washington, 1904.

A number of influences have been operating for ten years or more to arouse an interest, both scientific and popular, in the basketry of the American Indians. Our museums have sent their representatives far and wide in the search for types, and the competition of private collectors has resulted in a species of basket hysteria which shows no particular signs of abating. This interest, however aroused, is widespread and real and has at last found fitting expression in the sumptuous memoir on the subject which has just appeared from the pen of Otis T. Mason. Professor Mason has long ranked as the leading American authority on primitive industries and technique and there was no one so well equipped as he to undertake the task of collecting and reviewing the results of the scattered studies which have recently been accumulating at a rapid rate. He has acquitted himself admirably.

Primitive basketry is of interest chiefly from two aspects, namely, method of manufacture and decoration. Both phases are considered in the present work and are naturally given the lion's share of attention, but nothing which has to do with the subject in hand seems to lie outside the scope of the book. From the mental attitude of the woman who weaves to the use to which her product is put, all is fish to the genial author's net.

Professor Mason's general point of view is geographical and wisely so. There is no other method which would permit a survey of the disparate phases of his subject without hopeless confusion. His classification, avowedly arbitrary and determined by the available material, is:

1. Eastern region: Canada, Eastern States, Southern States, Western States.

2. Alaskan region: Interior Alaska, Arctic Alaska, Aleutian Chain, Southeastern Alaska, Queen Charlotte Islands.

3. Fraser-Columbia region: Fraser drainage, Columbia drainage.

4. Oregon-California region: Southern Oregon, California.

5. Interior Basin region: Southern Oregon, California.

6. Middle and South American region: Mexico, Central America, eastern and western South America.

Varieties of basketry, materials used (including a botanical list by Mr. F. V. Coville), methods of manufacture, methods of ornamentation, symbolism, uses of basketry, distribution of types, collectors and collections, and bibliography are all treated in successive chapters and supplemented by a superb series of 248 plates, many of which are reproduced in color. The result is a monograph incomparably the best in the field and one destined to stand as a high authority for years to come.

It would be too much to expect a work of such compass to be equally good at all points and it must be admitted that some of the chapters are much more satisfactory than others. The author disarms criticism to a great extent, however, by his very frank recognition of certain shortcomings.

As indicated above, the two points of chief interest are technique and ornament. In his chapters on methods of manufacture and distribution of types the author is at his best. They are both notable contributions to our knowledge. His descriptions of technique are so clear and accompanied by such a profusion of illustrations of stitches and weaves that little is left to be said. Similarly with the distribution of types. This is a matter of great ethnological significance and its treatment is thoroughly good. Museums and private collectors far and wide have been drawn upon for material, and the result is an exhaustive mass of information for which all ethnologists will be devoutly thankful.

With the sections on ornamentation and symbolism the author reaches his difficulties. These problems have been attracting attention for years. The development of geometric patterns from pictorial designs has long been recognized, and from the nature of the materials this geometric ornamentation reaches its greatest complexity in basketry. The main problem has shifted of late from that of how far geometric patterns have arisen from realistic designs to that of how far meanings are read into designs already conventional. That this latter is a widespread tendency is certain. Designs and types of designs are borrowed and borrowed widely and the symbolic significance of these same patterns on foreign soil is quite as rich as though totally different from that obtaining in the groups of their origin. Culture and temperament determine the meaning even if not the form.

The extent of this process is the present problem at issue and a necessary preliminary to its solution is an extensive study of the local distribution of types of patterns without regard to their interpretation. The tracing of pattern elements, say from California, northward through the Shahaptian to other stocks north and east would yield much. Such a research has never been made, and although he recognizes its necessity, Professor Mason does little more than touch upon it. It is greatly to be deplored that one so well fitted did not accomplish for ornament what he has done for technique, but the author's

explicit avowal that his primary concern is with the practical and not the esthetic stifles complaint while it leaves regret. Fortunately the splendid series of plates affords material for a study of this character which has never before been available to any one to whom our large museums are inaccessible.

Filled as they are with descriptive detail, Professor Mason's pages do not lend themselves to quotation in a notice of this character. The scope of his work has been indicated. Suffice it to say that it is a big book and a good book and we are grateful.

LIVINGSTON FARRAND.

COLUMBIA UNIVERSITY.

The Paleontology and Stratigraphy of the Marine Pliocene and Pleistocene of San Pedro, California. By RALPH ARNOLD. Memoirs of the California Academy of Sciences, Vol. III., pp. 420, pls. 37, 4to.

This memoir is the most important contribution to the invertebrate paleontology of the west American Cenozoic that has appeared since the publication of Gabb's 'Paleontology of the California Survey.' The author has worked very carefully over both the stratigraphy and the paleontology of the marine Pliocene and Pleistocene of California, obtaining more satisfactory results than have been reached by previous workers in paleontology. The field and laboratory work upon which the paper is based occupied the author for a large part of his time during nearly six years and every problem which presented itself has been carefully worked out to the minutest details. The paper was prepared at Stanford University, where the work was carried on under the able supervision of Professor James Perrin Smith.

The memoir is divided into two main divisions: Part I., a general discussion of the stratigraphy, faunal succession and faunal geography; Part II., a purely zoological discussion of the numerous forms represented in the faunas. Over four hundred species of invertebrates were obtained and this large number gives more than ordinary weight to the conclusions drawn by the writer.

The Pleistocene formations occurring at San Pedro have been designated by Dr. Arnold as the San Pedro series. This is divided into an upper and a lower division, which are separated by an unconformity. The fauna of the lower San Pedro includes 247 species, of which 12.5 per cent. are extinct. Of this number 64 per cent. of the species are now living at San Pedro, 17.4 per cent. are living only north of San Pedro, 3.2 per cent. only south of San Pedro. The conclusion is drawn that this is a cold-water fauna. The upper San Pedro fauna includes 252 species, of which 9.5 per cent. of the species are extinct. Of this number 68.2 per cent. are now living at San Pedro, 6.1 per cent. only north of San Pedro, 14.2 per cent. only south of San Pedro. The fauna of the upper San Pedro series more nearly resembles that found living on the Pacific Coast two or three hundred miles south of San Pedro. In other words, this is a warm-water fauna.

In addition to a careful discussion of the extensive series of species described from San Pedro, the author has studied a large number of other Pleistocene localities on the coast of California and has presented a valuable correlation table.

The author makes an interesting comparison of the faunas of the Californian and Japanese coasts in Pleistocene time, and has brought out the fact that the relationship was much closer then than it is now. As the lower San Pedro fauna of California is boreal, it is to be supposed that the northern fauna would also push down the Asiatic coast. In addition to this, the presence of a broad submarine shelf would make possible the interchange of species.

In Part II. of his paper Dr. Arnold has described many new and important species. He has made an equally important contribution in the redescription and figuring of a large number of species which have never been satisfactorily described or figured. This portion of the memoir will be of almost as much value to students of recent and Tertiary faunas as it will be to those who interest themselves in the life of the Quaternary.

The author and the editorial staff of the California Academy are to be congratulated

on the very satisfactory form in which the memoir appears. The arrangement of the material, the typography and the character of the illustrations are all worthy of favorable comment. JOHN C. MERRIAM.

SCIENTIFIC JOURNALS AND ARTICLES.

THE contents of the April number of the *American Journal of Mathematics* are as follows:

HENRY LEWIS RIETZ: 'On Primitive Groups of Odd Order.'

A. N. WHITEHEAD: 'Theorems on Cardinal Numbers.'

T. J. I'A BROMWICH: 'The Caustic, by Reflection, of a Circle.'

HARRY WALDO KUHN: 'On Imprimitive Substitution Groups.'

THE *American Journal of Psychology* for January contains the following articles:

W. P. MONTAGUE: 'A Theory of Time-Perception.'

BENJAMIN RICHARDS ANDREWS: 'Auditory Tests.'

E. B. TITCHENER: 'Some New Apparatus.'

I. M. BENTLEY and E. B. TITCHENER: 'Ebbinghaus' Explanation of Beats.'

C. SPEARMAN: 'The Proof and Measurement of Association Between Two Things.'

I. M. BENTLEY: 'Professor Cattell's Statistics of American Psychologists.'

THE first number of the *Journal of Comparative Neurology and Psychology* as recently reorganized appears in March with contents as follows: 'The Relation of the Motor Endings on the Muscle of the Frog to Neighboring Structures,' by John Gordon Wilson. A description with illustrations of the motor nerve endings with special reference to the ultra-terminal fibrils and the relation of the ending to the sarcolemma. 'Space Perception of Tortoises,' by Robert M. Yerkes. A quantitative study of the amount of hesitation exhibited by different species of tortoises before crawling over the edge of an elevated board and correlation of these data with the natural habits of the species studied. 'A Note on the Significance of the Form and Contents of the Nucleus in the Spinal Ganglion Cells of the Fœtal Rat,' by Shinkishi Hatai. A cytological examination of developing spinal ganglion cells to determine the functional significance of the centrosome, aster and Nissl granules and their relations to the nucleus, illustrated by two plates. 'An Establishment of Association in Hermit Crabs,' by E. G. Spaulding. A demonstration that the hermit crab is capable of profiting relatively rapidly by experience. Editorials, a summary of the neurological papers read at the mid-winter meetings and reviews complete the number.

THE March number of the *Botanical Gazette* contains a contribution from John F. Garber on 'The Life History of *Ricciocarpus natans*,' the investigation having resulted in a very complete morphological study, to which are appended biological data derived chiefly from observation of the plant in the field during one season and from experimental work in the laboratory.—Mabel L. Merriman publishes the results of her long study of 'Vegetative cell division in *Allium*,' this being one of the few complete studies of karyokinesis in vegetative cells of plants.—John Donnell Smith publishes his twenty-fifth paper entitled 'Undescribed plants from Guatemala and other Central American republics.'—Charles Thom describes *Craterellus taxophilus* as a new pecies of Thelephoraceæ.—J. M. Greenman publishes notes on the indigenous Centaureas of North America, describing one new species.—W. J. Beal makes another contribution to the vitality of seeds.

SOCIETIES AND ACADEMIES.

THE AMERICAN PHILOSOPHICAL SOCIETY.

THE general meeting of the society will be held on April 7, 8 and 9, in the hall of the society in Independence Square (104 South Fifth Street), Philadelphia.

Morning sessions, 10:30 A.M. to 1 P.M. Afternoon sessions, 2 to 4:30. Luncheon will be served in the rooms of the society from one to two o'clock. A reception will be given to the members and the ladies accompanying them at the Free Museum of Science and Art of the University of Pennsylvania on Thursday evening, April 7. The visiting members will be the guests of the resident members of

the society at dinner on Friday evening, April 8. The University Club, 1510 Walnut Street, extends the courtesies of its house to the visiting members during their stay in Philadelphia.

The preliminary program is as follows:

Dr. Charles Conrad Abbott, of Trenton, N. J.: 'On the Occurrence of Artifacts Beneath a Deposit of Clay.'

Dr. Charles Conrad Abbott, of Trenton, N. J.: 'On the Breeding Habits of the Spade Foot Toad (*Scaphiopus solitarius*).'

Professor L. H. Bailey, of Ithaca, N. Y.: 'Summary of the Recent Movements to Teach Agriculture in the Schools.'

Professor Carl Barus, of Providence, R. I.: 'Atmospheric Nucleation.'

Dr. Franz Boas, of New York: 'The Horizontal Plane of the Skull.'

Dr. Aristides Brezina, of Vienna: 'On the Collecting of Meteorites.'

Professor William Keith Brooks, of Baltimore: '*Doliolum* and *Scalpa*.'

Professor William W. Campbell, of Mt. Hamilton, Cal.: 'On the Spectra and General Nature of Temporary Stars' (with lantern slide illustrations).

Professor Edwin Grant Conklin, of Philadelphia: 'The Organization of the Germ Cells and Its Bearings on Evolution.'

Professor Charles L. Doolittle, of Philadelphia: 'The Reflex Zenith Tube.'

Mr. Eric Doolittle, of Philadelphia: 'Faint Double Stars.'

Dr. Charles B. Dudley, of Altoona, Pa.: 'A System of Passenger Car Ventilation.'

Professor John B. Hatcher, of Pittsburg, Pa.: 'An Attempt to Correlate the Marine with the Fresh and Brackish Water Mesozoic Formations of the Middle West.'

Professor Paul Haupt, of Baltimore: 'Biblical Pessimism.'

Professor Angelo Heilprin, of Philadelphia: 'Pompeii and Saint Pierre: an Examination of the Plinian Narration, and Other Studies' (with lantern slide illustrations).

Professor Waterman T. Hewett, of Ithaca, N. Y.: 'The Use of the Relative Pronouns in Standard English Writers.'

Waldemar Jochelson, of New York: 'The Yukaghis Language.'

Professor H. F. Keller, of Philadelphia: 'Dimethyl Racemic Acid, Its Synthesis and Derivatives.'

Professor Henry Kramer, of Philadelphia: 'The Origin and Nature of Color in Plants.'

Professor Preston A. Lambert, of Bethlehem, Pa.: 'The Expansion of Algebraic Functions at Singular Points.'

Professor Marion D. Learned, of Philadelphia: 'Results of the American Ethnographical Survey.'

Professor LeRoy W. McCay, of Princeton: 'Trisulphoxyarsenic Acid.'

Professor John Marshall, of Philadelphia: 'The Constituents of the Venom of the Rattlesnake.'

Professor Otis T. Mason, of Washington: 'The Ripening of Thoughts in Common.'

Dr. Charles A. Oliver, of Philadelphia: 'Regulation of Color-Signals in Marine and Naval Service.'

Professor A. H. Phillips, of Princeton, N. J.: 'Radium from American Ores.'

Professor Albert B. Prescott, of Ann Arbor, Mich.: 'The Rôle of Carbon.'

Professor Theodore W. Richards, of Cambridge, Mass.: 'Sources of Error in the Determination of the Atomic Weight of Nitrogen.'

Professor Felix E. Schelling, of Philadelphia: 'The Pedigree of Elizabethan Drama.'

Professor William B. Scott, of Princeton, N. J.: 'The Miocene Rodentia of Patagonia.'

Professor Edgar F. Smith and Mr. F. F. Exner, of Philadelphia: 'The Atomic Weight of Tungsten.'

Mr. Gilbert van Ingen: 'The Silurian Fauna of Arkansas.'

Mr. Joseph Wharton, of Philadelphia: 'Palladium.'

THE AMERICAN PHYSICAL SOCIETY.

The February meeting of the Physical Society was held in New York on February 27. For the first time since the famous address of Rowland in 1899 the society had the pleasure of listening to a presidential address, Professor Webster's subject being 'Some Practical Aspects of the Relations between Physics and Mathematics.' The address was delivered before a joint session of the Physical Society and the Mathematical Society. It will be published in full both in Science and with the 'Proceedings of the Physical Society' in the *Physical Review*.

Upon the recommendation of the council certain amendments to the by-laws were adopted whose purpose was twofold, viz.: (1) to

make possible the election of *associate members* as well as regular members; (2) to establish, for regular members, an entrance fee of three dollars.

The council was led to recommend such action because of its desire to extend the advantages of membership in the Physical Society to a larger number of persons, and at the same time to maintain a distinctly high scientific standard in the case of the regular membership. In the past the effort to accomplish both of these two aims has sometimes led to considerable embarrassment, both to the council and to members making nominations.

The policy of the council will hereafter be to elect to regular membership in the society only such persons as have contributed to the advance of physics by investigation of a serious character. Those who have been prevented from carrying out work of investigation, but who are otherwise desirable as members of the society, will be eligible for election to associate membership. Associate members will have all the privileges of membership except that they may not vote nor hold office. They will, for example, receive the two publications now furnished by the society to its members. Associate members may be transferred to regular membership by action of the council whenever they have completed research work of such character as to warrant such transfer. It is not the policy of the council to make election to associate membership a mere formality for any who may desire it. On the contrary, there is a strong feeling that the society would best accomplish its object in 'promoting the advance and diffusion of the knowledge of physics' by maintaining a high standard for both regular and associate membership.

The spring meeting of the society will be held in Washington, on Friday, April 22, and Saturday, April 23, 1904. Sessions for the presentation of papers will be held on Friday from 2 P.M. to 5 P.M., and on Saturday from 10 A.M. to 1 P.M. On Friday at 6 P.M. there will be an informal dinner, and later in the evening a lecture upon a subject to be announced later. On Saturday, at 1 P.M., a luncheon by the Philosophical Society of Washington, complimentary to the Physical Society. Saturday afternoon an excursion to the Bureau of Standards and the Weather Bureau. The arrangement of further details regarding the meeting is in the hands of a committee of the Philosophical Society of Washington, at whose invitation the meeting is held in that city.

Brief abstracts of the papers read at the February meeting are given below.

The Conduction of Electricity in Mercury Vapor: A. P. WILLS.

This paper gave the results of an extended study of the mercury vapor lamp carried out in the Hewitt laboratory during the past year. The measurements had especial reference to the electromotive intensity in the positive column. It was found possible to develop an empirical formula representing with great accuracy the dependence of the potential gradient upon current, pressure and diameter of tube. The drop at the anode, usually about seven volts, was found to rise under abnormal conditions as high as fifteen volts. The drop at the kathode was about five volts.

Experiments Showing the Action of a Magnet upon the Mercury Arc: PETER COOPER HEWITT.

Several very interesting experiments with a large mercury vapor lamp were shown by Dr. Hewitt. The action of a magnet upon the positive column seemed to be about the same as in an ordinary vacuum tube. The effect upon the brilliant spot of light, or flame, at the kathode was especially interesting. When the lamp was in a rather strong field a luminous bundle of rays was seen to proceed from the bright spot on the kathode surface, following a path that was the same as that of the lines of force of the field.

Microphotography of Fog Particles and the Photographic Study of Atmospheric Nucleation: CARL BARUS.

The author gave a description of his apparatus and methods, and illustrated the results by a series of ten lantern slides and many positives showing the microphotographs of fog particles. Most of these were strikingly distinct, the water globules ranging in size from

about .0002 cm. to .002 cm., according as fogs of different degrees of fineness were precipitated. The most highly graded nuclei, as shown by the presence of fog particles of all sizes, were obtained from an exposure of dust-free air to the X-rays for from one to ten minutes, depending on the intensity of radiation. Much greater uniformity is shown in the cases of phosphorus and ordinary air nuclei.

The author described a number of curious phenomena observed with these water particles, among which their continued motion when caught on a film of liquid oil, simultaneously to and fro between edges of the film, is most noteworthy. Particles moving in swarms in opposed directions are often in the focus of the microscope together, and thus lie very nearly in the same plane. The author finally remarked that the coronal method had now been so far perfected that the nucleation increment produced by a single gas flame in a moderately large lecture room could be detected in about ten minutes, even in the air collected from near the floor. This favorable quantitative result may then be supplemented qualitatively by the photographic method, which will show the presence of exceptionally small or large particles, whose effect vanishes from the corona as they are relatively few in number.

Preliminary Measurements of the Short Wave-lengths Discovered by Schumann: Theodore Lyman.

The measurements were made with a concave grating ruled on speculum metal, which was found to reflect the extremely short waves used in considerable intensity. All work was carried on in an atmosphere of hydrogen and at low pressures. Numerous lines were found in the spectrum of hydrogen lying well beyond the aluminum group at 1,854. The shortest wave-length thus far measured by Dr. Lyman was 1,206 Angström units. This lies far beyond the region where wave-lengths have previously been *measured*. Dr. Lyman is certainly to be congratulated upon the success of these distinctly difficult measurements. The present communication is merely preliminary.

The Hall Effect in the Electric Arc: C. D. Child.

If two carbon pencils are so placed in an arc that there is little or no potential difference between them, a potential difference is produced by creating a magnetic field about the arc. This may be as high as 1.5 volts. It appears to be similar to the Hall effect in metals, and if it is this effect, it would show that the negative ions have a velocity enormously greater than that of the positive.

Salts placed in the arc which diminish the drop of potential at the anode also diminish the effect here studied. With KNO_3 the anode drop becomes as small as that at the cathode and the potential difference between the two pencils became approximately zero. When the pressure is reduced to about 1 cm. the effect also disappears.

No definite explanation of the phenomenon can at present be given. It appears, however, to be a more complicated effect than the ordinary Hall effect in metals.

Some Further Observations on the Radiation Produced in an Alternating Condenser Field: Fernando Sanford.

The author has continued the experiments described in the December number of the *Physical Review*, where it was found that certain photographically active rays are given off by a plate connected to the *negative* pole of an induction coil, even when no visible discharge occurs. It has now been found possible to measure the wave-length of these rays by means of a grating. Values are found ranging from 350$\mu\mu$ to 377$\mu\mu$, depending upon the metal of the kathode. The rays, therefore, lie in the ultra-violet just beyond the edge of the visible spectrum.

Ernest Merritt,
Secretary.

The Geological Society of Washington.

The 151st meeting was held on February 10, 1904.

A topographic model of Alaska made by Mr. Edwin E. Howell was exhibited and was briefly described by Mr. Alfred H. Brooks.

This model of Alaska, which is to form a part of the Geological Survey exhibit at the

Louisiana Purchase Exhibition, is based, for the most part, upon the topographic surveys made during the past six years by the Geological Survey parties. The coast line is taken from the charts of the Coast and Geodetic Survey. The base map, which was also exhibited, was compiled by Mr. E. C. Barnard, under the direction of the late Mr. R. U. Goode, and the scale of both the model and the map is forty miles to the inch. In the model the vertical scale has been exaggerated five times, while on the map the contour interval is 1,000 feet. This map represents the first attempt to show the relief of Alaska by contours. While much of it will be subject to revision by future surveys, it is believed that in its present form it is of a sufficient degree of accuracy to be worthy of publication and that it correctly represents the larger geographic features of the territory.

The coloring of the model is intended to indicate, in a broad way, the distribution of timber, as well as that of the ice and snow. Many will be surprised to find what a small part of Alaska is covered with perpetual snow and that the glaciers are practically confined to the coastal mountains of Alaska. It will be noted that the heavy timber is limited to the Pacific coastal belt of Alaska, east of Kodiak Island, and to the immediate vicinity of the larger rivers of the Yukon Basin. Above the timber line, which in southeastern Alaska is between 3,000 and 4,000 feet, and in the northern part of the territory descends to about 1,000 or 1,200 feet, are broad areas which are entirely devoid of forests. The attempt has been made on the model to represent this treeless region by colors suggestive, at least, of vegetation.

Besides this high timberless belt there are other large areas of regions of relatively low relief, which are also devoid of timber. These are the coastal plains, which stretch from the Alaskan Peninsula northerly to the Arctic, and thence sweeping around to the north of the Rocky Mountains, extend eastward to the McKenzie. This so-called *tundra* is a part of the great zone which encircles the polar regions. It is devoid of timber except for the dense growth of willow which is found along many of the sheltered stream valleys.

Alaska includes an area of about 570,000 square miles, about one fifth of the area of the United States, and two thirds of the region included in the Louisiana Purchase. The shape is irregular and consists of a large compact body of land, with projections to the southeast and southwest, the former called the Panhandle, or southeastern Alaska, and the latter the Alaskan Peninsula. The peninsula is extended to the westward by the Aleutian Chain, to where it is met by the Commander Islands, a somewhat similar easterly extension from the Peninsula of Kamchatka.

The Pacific and southern Bering Sea coast of Alaska exhibits unusual irregularity of form, including many islands and many fiords which penetrate the mainland. The arctic and northern Bering Sea coast line is much more regular, and is characterized by shoal water conditions and straight shore lines. The relief of Alaska exhibits a wealth of contrasting variety in mountains and valleys, plateaus and lowlands, which are developed on a truly grand scale. Broadly speaking, the larger features of topography correspond with those of the western United States. There is a Pacific Mountain system separated from the Rocky Mountain system to the north by a Plateau Region, and north of the Rockies lies a plains region, forming the Arctic Slope Province.

The Pacific Mountain system includes four ranges, the Coast, the St. Elias, the Aleutian and the Alaskan. The highest points in northwestern America and also on the continent lie within these ranges, and are Mount St. Elias, 18,080; Mount Logan (Canada), 19,500, both in the St. Elias Range; and Mount Foraker, 17,000, and Mount McKinley, 20,300, the two latter in the Alaskan Ranges.

Less is known of the Rocky Mountain system, which extends through the Yukon territory, and upon approaching the Arctic coast bends westward. To the west it is divided into two ranges separated by the valley of the Kobuk River. Between the two mountain systems lies the province which has been called the Plateau Region. This is char-

acterized by broad, flat-topped inter-stream areas, whose summits mark a well-defined plain. The Arctic Slope Region includes a small area lying north of the Rocky Mountains.

The model shows not only the relief, but also the distribution of the timber and the mineral deposits, as far as they have been determined. It will be noted that the gold placers have a very wide distribution through Alaska, that copper has been found only in the Pacific Mountain belt, tin at the western end of the Seward Peninsula, while coal has been found in many widely separated localities. The lode mines which have been developed up to the present day are practically all confined to the Pacific Coastal belt.

Mr. George B. Shattuck then presented a paper on 'Recent Elevations and Depressions in the Bahama Islands,' illustrated by stereopticon. This paper was based on the results of the expedition sent out by the Geographical Society of Baltimore, and will soon be published in full.

A third paper, by Mr. G. K. Gilbert, had for its subject, 'Domes and Dome Structures in the Sierra Nevada,' and is now in print as a bulletin of the Geological Society of America.

Alfred H. Brooks,
Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON.

The 383d regular meeting of the society was held on Saturday evening, March 5, 1904. Dr. A. K. Fisher delivered an illustrated lecture on the 'Birds of Laysan Island,' based on observations made by W. K. Fisher, of Stanford University, during the summer of 1902, while connected with the U. S. Fish Commission steamer *Albatross*. Laysan Island, which lies in the Pacific, about 800 miles northwest of Honolulu, is one of the most remarkable bird islands in the world. It is the home of countless thousands of sea birds, such as albatrosses, terns, gannets, frigates, shearwaters, petrels, etc., and has rarely been visited by naturalists. A most detailed account of the bird population of the island was given. The photographs shown constitute one of the most interesting series of bird pictures ever taken.*

Mr. J. N. Rose exhibited some fifty water-color drawings to illustrate the genera of Crassulaceæ recently segregated by Dr. N. L. Britton and himself. The drawings are the work of Mr. F. A. Walpole and have been executed with great skill. Mr. Rose pointed out the fact that the number of genera in Crassulaceæ as compared with the number of species is very small, and that nearly all the species of the world are to be found in six genera. He states that complaint is often made that the generic limits are very indistinct which he thinks can be remedied by increasing the number of genera. He finds that *Cotyledon*, a South African genus, is to be excluded from American groups, and that, in place of it, *Echeveria* is to be restored. To the latter most of the Mexican species are referred. A new genus, *Dudleya*, is proposed for certain species from the west coast of North America.

Wilfred H. Osgood,
Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

The 581st meeting was held February 27, 1904. The evening was devoted to aeronautical subjects.

Dr. A. F. Zahm read a paper on 'Atmospheric Friction with Special Reference to Aeronautics,' giving a partial account of one of the researches on air resistance which he has been conducting the past three years, at the Catholic University of America. His measurements show that the skin friction R, of a thin material plane of length l, and speed v moving through still air, is expressed by an equation of the form $R = al^m v^n$, in which a, m, n are numerical constants for all speeds up to the limit of experiment, which was about 25 miles an hour. For a strip of the plane one foot wide and l feet long moving v miles an hour, the above formula gives $R = 0.0000336 l^{0.93} v^{1.85}$,—$R$ being in pounds. Applying this equation to practical problems he showed that the element of skin friction is

* An illustrated account of the birds of Laysan has been published by W. K. Fisher, Bull. U. S. Fish Comm. for 1903, pp. 1–39, pls. 1–10.

as formidable an obstacle in aeronautics as in marine navigation, where it is one of the chief resistances. To overcome the friction on the surface necessary to support 100 pounds under practical conditions of flight requires about one horse power on a tow line, or nearly two horse power applied by propellers.

Mr. Charles M. Manly, of the Smithsonian Institution, presented the 'History and Present Status of Aeronautics.' He traced briefly the development of balloons for a century till Renard and Krebs in 1884 made a flight of two and one half miles, returning to their starting point; and he gave the data of the machines and flights of Santos Dumont, von Zepplin, Le Baudy brothers and others. The highest speed reported is twenty-three miles per hour.

The development of aeroplanes was traced in more detail. Models heavier than the air were flown in 1842 and 1878. In 1868 Stringfellow built a model with steam-engine and boiler carried by the superposed planes suggested by Wenham in 1866, though this never flew. In 1891 Professor Langley, and about the same time Maxim in England, published the results of systematic experiments on the principles underlying the subject. Some years later successful flights were made by machines with motors of over one horse power. In 1903 Mr. Langley's aerodrome, with a 52 horse-power gasoline-engine weighing with cooling water and all accessories only 200 pounds, and carrying one passenger, was launched. Accidents to the launching devices prevented a successful flight; but the speaker had no doubt of the ability of the machine to fly. Reference was made to the reported success of the Wright Bros. in North Carolina, but full data are not yet available; to the remarkable invention of Mr. A. G. Bell whose tetrahedral kites promise to furnish supporting planes, the weight of which increases little faster than the area; and to the experiments of Lilienthal and others with gliding machines.

In the discussion that followed Professor Langley emphasized the value of Dr. Zahm's measurements, of Mr. Manly's work in reducing the weight of the motor, and of Mr. Bell's novel supporting planes. Professor Bell told of the curious history of the idea of air *ships*, and said Mr. Manly was the first to risk himself on a power-driven aeroplane. Others spoke of recent English theoretical work, and of the attitude of the U. S. Patent Office which, though granting nearly 300 patents for structures involving a gas bag, has held that aeroplane devices, not having been shown to be operative, are not entitled to protection by a patent.

CHARLES K. WEAD,
Secretary.

THE NORTHEASTERN SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE fiftieth regular meeting of the section was held in Huntington Hall, Massachusetts Institute of Technology, Boston, Thursday evening, February 25, with President W. H. Walker in the chair. About 900 members and guests were present.

Mr. E. Stütz, vice-president of the Goldschmidt Thermit Co., gave an address on 'Aluminothermics, and their Applications to Engineering and Metallurgy.' Mr. Stütz described the various uses of thermit, the trade name given to a mixture of powdered aluminum and the oxides of various metals, in which when ignited a reaction is brought about, whereby a great amount of heat is generated, oxide of aluminum is formed, and the metal set free from its oxide is obtained in a molten condition. Large masses of pure chromium, manganese and other metals were shown, and a demonstration of the preparation of pure nickel from the oxide was made. The principal use of thermit at present is in the formation of iron from a mixture of powdered aluminum and oxide of iron, and the application of this to various forms of welding. Mr. Stütz demonstrated the method by burning a hole through a plate of wrought iron three fourths inch thick, by allowing a stream of molten iron as formed by the reaction to fall on the plate, also by welding a nine-inch girder rail, by welding iron to casting to illustrate a method of repairing flaws, by welding iron pipe, and other experiments.

A number of lantern slides were also shown,

illustrating the practical methods of using thermit in welding electric car rails in place, repairing broken stern posts and shafts in large steamers, etc.

ARTHUR M. COMEY,
Secretary.

DISCUSSION AND CORRESPONDENCE.

CONVOCATION WEEK.

IN the multitude of counselors there is said to be safety, and it may be hoped that a sound conclusion may be evolved from the widely differing views which are finding expression in the columns of SCIENCE.

In my own opinion, as in the opinion of some others who have already written, it has been a mistake to change the time of the meeting of the American Association from summer to winter. The American Association is and should be a popular association. It seeks to include in its membership not alone professional workers in science, but the wider public who have a more or less intelligent interest in the results of science. It appeals not only to the professors in the universities and colleges, but also to the great army of teachers in the secondary schools. It draws its members not from one district, but from all parts of the continent. Now I think that the time for the meeting of such an association is the summer vacation. In our winter, long journeys are apt to be more or less uncomfortable, and trains are not infrequently seriously delayed by snow. It is impracticable for the colleges and schools to arrange their work so as to allow a long vacation at Christmas time; and part of the Christmas vacation is and ought to be devoted by most of the students of science in the country to the claims of home and family. Both the inclemency of the weather and the shortness of the time at our disposal render it impossible to have excursions in connection with a Christmas meeting; and, in the American Association, as in its illustrious prototype, the British Association, the excursions are a very valuable part of the privileges offered by the meeting. Any one who has attended a meeting of the British Association in recent years, studied the elaborate guide-book for the locality prepared by the local committee, and availed himself of the opportunities of excursions adapted to his own tastes and studies, whether he be a geologist or a naturalist or an archeologist or an engineer, will appreciate how valuable this part of the work of such an association may be made. These excursions are valuable alike to the professional scientist and to the amateur.

While the Christmas vacation seems to me a very unsuitable time for the meetings of the American Association, it is an excellent time for the meetings of the numerous associations of more restricted membership and more definite scope. In several cases these narrow professional societies have already divided themselves into sections distributed in different regions of the country. The members of a local section of such a society can easily get together in the Christmas vacation. The journeys required are comparatively short, and the time at their disposal is amply sufficient. Their program does not aim to cover all science; they are not required to do anything in the way of popularization; they can meet for a few days of quiet, earnest work in the discussion of the papers of a homogeneous program; they can find relief from the serious work of the sessions in a dinner or a smoker or both; and, when they have done their scientific work, and enjoyed their friendly greetings and renewal of cherished associations, they can go home in season for the opening of the winter term in the institutions with which they are connected.

It was said by many that the large attendance and the great interest in the Washington meeting were the vindication of the plan of a winter session of the American Association. It must be remembered, however, that Washington is altogether an exceptional city. In the number of resident scientific men, and in the variety of museums and other indoor attractions for students of science, professional or amateur, Washington stands unrivaled. The success of the Washington meeting was due to the exceptional character of the locality. The comparative failure of the St. Louis meeting affords more nearly a just criterion of the expediency of the plan.

I believe, therefore, that the right plan is to put back the meeting of the American Association to its old place near the close of the summer vacation, and to leave convocation week for the smaller, more homogeneous, and less popular associations of working scientists.

WILLIAM NORTH RICE.

NATURAL SELECTION IN KINETIC EVOLUTION.*

THAT there are species, varieties, mutations or hybrids which differ in one, two, or three characters, as commonly assumed in discussions of Mendel's laws, is a misleading assumption. To speak of a species as having developed in one direction or as having a single peculiar character may be permissible for taxonomic purposes, but in evolutionary studies it is careless to forget that the diversity is general, if not complete. The diversity of varieties and species is like that of individuals, but greater. Evolution, which is a continuous summary or integration of this individual diversity, is not a simple process, but highly multiplex; as much so, indeed, as the lines of descent in which the life of the species goes forward. A composite general direction is maintained by the species because the multitudinous strands of individual descent are bound together by interbreeding. The variations take place in particular threads, but evolution signifies rather the progressive change of the whole organic network.†

The evolution of a new type means changes in many directions and of many kinds, in the germ cells and in the various tissues and organs, as well as in the external form of the complex cell-colony which we are accustomed to look upon as a single individual. Each cell, tissue, organ and feature is undergoing evolution, and for normal and permanent progress these manifold developments must keep together. When single lines or slender strands of descent are separated from the main network the congruence of type is lost. The normal variation and individual diversity of the species having been eliminated, the evolutionary coordination of cells, organs and functions breaks down, and abrupt changes or aberrations of heredity appear. These degenerative mutations may not differ in their essential nature from normal variations, but the conditions of their appearance are abnormal, and the results often disastrous.*

A domestic variety may be 'improved' by the further increase of the one or two characters or qualities which render it valuable, but a new specific or generic type is the compound or resultant of many variations in many characters. By close selection which restricts evolutionary progress to a narrow line of descent a 'single character' may push out farther in a decade than the natural multiplex evolution would carry it in a century or a millennium, but such a specialization weakens and unbalances the organism, and is a process of degeneration rather than a constructive evolution. Selective inbreeding and other forms of isolation accentuate single characters, but the interbreeding of normally diverse individuals (symbasis) weaves new types out of the variations of many lines of descent.

The neglect of this distinction vitiates much evolutionary literature, both that which treats selection as an actuating 'force,' and that which rejects selection for 'discontinuous variation' or 'the mutation theory.'† It is

* Read before the Biological Society of Washington, March 19, 1904.

† *The Popular Science Monthly*, March, 1904, p. 451.

* Mutations, like hybrids, are sometimes completely sterile, and they may have at the same time an increased vegetative vigor. The vegetative vigor of many mutative varieties of domesticated plants has doubtless delayed the recognition of their abnormal evolutionary status, though the abnormality of infertile hybrids has long been appreciated. It is paradoxical, indeed, that the increased vigor which accompanies normal variations and crosses should also attend degenerative changes, but there is room for this apparent contradiction in so complex and many-sided a process as evolution.

† Very recent examples of the latter tendency are found in Professor Morgan's 'Evolution and Adaptation' and also in Dr. D. T. MacDougal's review of this work (*Torreya*, 3: 185, December, 1903). Professor Morgan refers (p. 368) with approval to an admission by Darwin that selection can not explain dimorphism in plants be-

true that many variations of inbred domesticated plants and animals are very abruptly discontinuous, and that such changes are not caused by selection,* but these facts in no way militate against others equally obvious, that the natural evolution of new types is a relatively slow and gradual process, and that selection may easily influence the direction of this continuous vital motion. The older selective hypothesis was only half erroneous. Selection does not set stationary organisms in motion, but it often guides spontaneous change. It does not explain evolution or vital motion in general, but it does explain adaptation, or motion in some particular direction, as when one species differs from its relatives in special characters which enable it to exist in a special environment. That all adaptations are mere coincidences is as improbable as that all characters represent useful adaptations.

Selection is not, as many 'Darwinians' have maintained, the true, efficient cause of evolution; the vital motion of species proceeds whether selection is operative or not. Species do not acquire characters from the environment, but merely in accordance with it. At any point in the evolutionary journey, selection may determine whether certain characters shall be acquired or not; it is an obstacle in the environmental road over which the species would travel, instead of being the source of power of the organic automobile. By preventing motion in one direction selection may be said, of course, to cause advance in another, but it is apparent that this causality is negative and passive, or a mere figure of speech. Selection may explain why a particular character is accentuated in a particular species, but it is no more a cause of the developmental progress of the species than the turns of the road are the motive power of the vehicle. Segregation enables species to attain differential characters, and selection assists their accommodation to environment, but both these possibilities rest on the more fundamental fact that organic evolution goes forward without external causation in groups of diverse, interbreeding individuals. If a species stood still selection could effect nothing except its partial extinction. In the recognition of a continuous and universal evolutionary motion the kinetic theory supplies the long-sought explanation of selective influence. By ceasing to look upon selection as a mysterious evolutionary cause we are able to ascribe to it a practical and easily comprehensible evolutionary function.

O. F. Cook.

Washington, D. C.,
March 11, 1904.

cause it can not be an advantage to a plant to be able to breed with only half of the members of its species. The same reasoning would apply, however, to all the phenomena of sexual separation, of which the dimorphism of bisexual plants may be an incipient stage. It seems obvious, too, that to breed successfully with half of the individuals of a species is an important advantage over the alternative of breeding less effectively with all of them. The partial or complete sterility of some dimorphic plants to the pollen of others of their own caste may be due to impotency rather than to adaptation, and a dimorphism by which this fatal result could be avoided would certainly be favored by selection.

* Except as selection implies inbreeding, by which mutations are induced.

NATURE STUDY.

To the Editor of Science: In the last two numbers of Science have appeared articles by Drs. Wheeler and Chapman on the abuses of nature writing as exemplified in the writings of Wm. J. Long. These articles have expressed the fear that such work may increase and that it may invade the secondary schools as supplementary reading designed to aid in the instruction in zoology. That this is no idle fear is brought very vividly before the science teacher in the normal schools, for he stands, as it were, an outpost between science and its teaching to immature students. Permit me to call your attention to a pseudo-scientific extravaganza put forth in a seeming serious mood which exemplifies this point. Before me is a book designed evidently for students of the first grades called 'The Tree Dwellers.' It bears the publishers' imprint of Rand, McNally and Co., 1903, and its author is Katherine E. Dopp, of the Extension Division of the Chicago University. The attempt of the book is to place before the stu-

dent an account of primitive child life. The author states in her preface that she was aided in the preparation of her material by the late Professor J. W. Powell, by Fred. J. V. Skiff, of the Field Columbian Museum, and by Professor Dewey, of the Chicago University; other less prominent names are mentioned as collaborators.

Perhaps the most glaring errors that the author has included in her work are certain of the pictures; these are signed by Howard V. Brown.

On page 67 is a sketch of a dinosaur, evidently intended for the *Ceratosaurus* of Marsh, an Upper Jurassic form, chasing a beast that is described as a 'five-toed horse'; accompanying this figure is the following text:

Long, long before the tree-dwellers lived there were wild horses.

They were tiny little creatures.

Perhaps you would not think that they were horses at all.

They were no larger than a fox.

They had stripes like a zebra.

They had five toes on each foot.

They lived on the marshes and on the dry land.

The land at that time was almost covered with water.

The water was filled with fish and reptiles.

Great reptiles crawled about everywhere.

They were masters of the sea and the dry land.

All the creatures feared them, the wild horses tried to keep out of their reach.

The foot of the little horse was not shaped for running, but it was fitted for climbing trees.

When a reptile appeared the *horses climbed the trees.* (Italics mine.)

They stayed in the trees till the danger was passed.

Then they came down to their pastures again.

Again, on page 62 I find a picture of a man in a tree watching a herd of the same horses (?) that were pursued by the Jurassic dinosaur! This makes man contemporaneous with the dinosaur, although it is not so stated in the text.

This book is filled with just such mistakes throughout, notably a figure of a saber-tooth tiger in fierce combat with a hairy mammoth.

That such a book is taken seriously by certain people is shown by the fact that it has been placed in the library of at least one normal school as supplementary reading for students in the kindergarten course, girls who are preparing themselves to teach nature study to infants.

Certainly if such things as anthropology and vertebrate paleontology are to be forced on the four-year-old child the perpetrators should see that it is correct.

We are promised four other volumes by the same author from the same press! Certainly it is time to call a halt.

E. C. CASE.
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MILWAUKEE, WIS.

SPECIAL ARTICLES.

AN ACCOUNT OF SOME EXPERIMENTS IN REARING WILD FINCHES BY FOSTER-PARENT BIRDS.

DURING the spring of 1901, having some twenty pairs of canary birds mated, I attempted to induce them, in two cases, to incubate the eggs and rear the young of wild fringilline birds. These experiments led me to continue similar efforts during each succeeding spring, and I propose to summarize the results of what occurred in this way, in 1901, 1902 and 1903.

In May, 1901, I secured a set of song sparrow's eggs (*Melospiza cinerea melodia*). There were four eggs in the nest and incubation had just started. I brought the eggs, together with the nest, to my laboratory, and took away from a very tame hen canary bird four eggs which were in her nest, substituting the song sparrow's eggs. I watched the hen canary for a short time to assure myself that my actions had not prejudiced the end I had in view, and was presently delighted to see her return to the nest and settle herself to brood the eggs as if they were her own. In due time, after about eight days, all of the eggs were hatched, and four lusty young song sparrows became the foster-children of the canary. This bird was an especially good parent, as I had proved, by her rearing with success three broods of canary birds during the preceding season of 1901, the whole of the young aggregating thirteen birds, all of which reached maturity, and were strong vigorous examples of their kind. This hen canary

seemed as solicitous for the young song sparrows as she had been for the young of her own kind, and so far as I could see, she did everything in her power to rear her foster-children. In spite of all her efforts, when the song sparrows attained an age of about six days, and were just beginning to show feathers, one by one they weakened and died, though both the parent canaries, cock and hen, fed and brooded them constantly.

Later in the same season I secured a clutch of four field sparrow's eggs (*Sipizella pusilla*), and gave them to another equally good pair of parent canaries. The results were almost identical with the case cited above; the eggs were all hatched, the young seemed strong and vigorous, the foster-parents appeared to do everything conducive to their development, but all of the young died during the first week after they were hatched from the egg. This concluded my efforts in this direction for the spring of 1901. In the month of May, 1902, I was able to carry on a much more elaborate series of experiments, which I will now summarize. Some of these, in the light of my former experience, I conducted under slightly varying conditions, which I thought might yield more definite results. On May 11, 1902, I found in a field on the ground a nest of field sparrows, the female sitting on four eggs, and there were, at the same time, two larger eggs in the nest, which I took to be those of the cowbird (*Molothrus ater*). The nest and eggs I brought to the house, keeping them warm, and placed the four field sparrow's eggs under a hen canary which was sitting, and the two cowbird's eggs I gave to another canary. Both females covered the new eggs which had been introduced into their nest, and brooded them within a moment after I had left them. The four field sparrow's eggs, placed under the first canary, began to hatch on the morning of May 22. I had left one canary bird's egg in this nest, and this also was hatched early the next day. Another of the field sparrow's eggs hatched late on May 22, and in the morning of May 23 there were in the nest one canary and three field sparrows, and one unhatched egg of a field sparrow. On May 24 I discovered the three field sparrows dead in the nest, but the young canary bird was flourishing, and in the course of time grew up to maturity under its parents' care.

To return to the cowbird's eggs in the same clutch; both of these eggs were hatched on the morning of the twenty-second, and, also, two canary bird's eggs which I had left with them, so that there were two cowbirds and two young canary birds in the nest. Throughout the day and on the succeeding one the parent birds paid close attention to the brood, and the young birds, I could see, were strong and hearty, as all four of them raised their heads to be fed, and seemed to be treated precisely alike by the two parent canaries. The same conditions prevailed on May 24. On the morning of May 25 the birds were doing well and had grown rapidly. On the afternoon of May 25 one of the cowbirds died, though the other was still strong, and with the two young canary birds was constantly fed by the parents. On May 25 the second cowbird died, and I introduced two young chipping sparrows, apparently of about the same age as the two young canaries, to take the place of the two cowbirds. I saw the old canary bird at once feed the two sparrows as she did her own birds, and during the day a young man, whom I had posted to watch the proceedings, reported that they were constantly fed. On May 27 the two young sparrows were strong and healthy, as well as the young canaries. The same conditions prevailed on the twenty-eighth, and on the twenty-ninth of the month. On May 30 one of the sparrows died and was removed. the other appeared strong and healthy, and so far fledged that its species could be discriminated. The old birds fed the remaining young one throughout the day as well as the young canaries. On May 31 the young sparrow and the canaries were vigorous and flourishing. This condition of affairs was maintained until June 2. On June 2 I found the single sparrow so far grown as to be able to leave the nest, though the two canaries were not so far advanced. At eleven o'clock the young sparrow left the nest and hopped about the floor of the cage; after an hour I put him back in the nest, where he remained till the

next morning. On June 3 the chipping sparrow again left the nest, and I did not return him to the structure until late in the day. On the fourth, the two young canaries and the chipping sparrow all left the nest, though the canaries resorted to it from time to time. All the birds grew and flourished, but on the ninth of June the chipping sparrow died. The two canary birds, however, throve and ultimately reached maturity. During the latter part of his life the sparrow was going about the bottom of the cage and hopping on the perches, attended to carefully by the parent birds. He, however, did not seem especially strong in his legs, and for a short period, four or five hours before his death, he was not only unable to grasp the perches, but could not run about the bottom of the cage as he had done earlier. I concluded that several factors may have militated against the rearing of this bird by the canaries: (1) His development seemed more rapid than that of the young canaries, and he was more restless and anxious to leave the nest than were the domesticated birds. (2) I think that the artificial lining of the canary's nest was of such a nature as not to permit the proper development of the leg muscles and feet during the time he was in the nest. (3) The length of the tarsus in the sparrow, being twice as great as that of the canary birds, seems an important element to take into account, as this part of the leg was so long that it seemed to be not only in his way, but was constantly trodden on and sat upon by his two associates. It must be remembered that this bird left the nest voluntarily on the date first mentioned, and though restored several times, very soon left it again. He appeared to be very uncomfortable in the nest, and this discomfort was largely due to the length of his legs. At the time of his death the bird was about two thirds grown, and almost fully feathered in the first plumage of the chipping sparrow (*Spizella socialis*); though he could hop about the floor of the cage, and for a time was able even to balance himself on the perches, his legs, on the whole, seemed weak, and I attribute the cause of this misdevelopment of the muscles and tendons of the feet and legs to the kind of nest lining used by the canaries. I may say here that this consisted of deer-hair with an admixture of cow-hair, the whole being a felted mass, and not presenting the grasping surface afforded by the fabric and lining of the chipping sparrow's nest, as found out of doors.

My experiments in the season of 1902 included, besides the above, an additional brood of song sparrows, which contained four song sparrow's and one cowbird's egg. All of these hatched and lived from periods varying from four to seven days, none of the birds leaving the nest. I also experimented with a clutch of five fresh eggs of the yellow-winged sparrow (*Ammodramus savannarum passerinus*), which I divided between two different parent canaries, leaving two canary's eggs with three yellow-winged sparrow's eggs, and in the other case two yellow-winged sparrow's eggs with three canary bird's eggs. Both clutches were hatched, there being five young birds in each nest. The canary birds in both cases were reared and reached maturity, but the young yellow-winged sparrows which were also hatched died at ages varying from four to seven days.

I also attempted during this season to raise young bobolinks under canaries (*Dolichonyx oryzivorus*); to this end on May 28, having found a nest of five eggs, I introduced two of them to a large breed of English canary, leaving two of her own eggs in the nest; the other three bobolink's eggs I placed under another canary of a similar kind, leaving two canary eggs in addition. This canary threw out her own eggs, but retained the bobolink's eggs, and incubated them till they were hatched, which was on June 8. The three young bobolinks lived for three days, when one of them died; the remaining ones died on the fifth day. The other bobolink's eggs, under the English canary, were also hatched on the eighth, but both died on the tenth of the month; the young canary birds hatched at the same time were reared to maturity, when I no longer followed their history.

In the spring of 1903 I tried several similar experiments, sometimes putting but one egg of a wild bird with a clutch of canary's eggs,

and never giving one canary an entire complement of wild bird's eggs. In all cases the eggs were hatched and in no case did the foster-young attain an age of more than a week, though it is to be remembered that in every case young canaries in the same brood with the foster-birds flourished and reached maturity. During the season of 1903 I took two young song sparrows, just beginning to show the feathers, and put them with two canaries about the same size, though more fully feathered. These birds were readily adopted by the parent canaries, but one of them died after three days; the other was reared, reached maturity, was weaned by the old birds, being treated precisely as were their own young, and is still alive at this writing.

This series of experiments I have reported as a suggestion for further work of a similar kind. I had hoped that hatching the eggs of wild birds under canaries would enable me to observe the development of the foster-young to an advanced age. It seemed to me that there would be no possibility of their song being other than such as could be attributed either to inheritance or to intimate association with a new kind of singing bird. In all this I have, of course, met with disappointment; the only young bird being reared to maturity, from the many I have tried, was a song sparrow, almost fledged before introduced to his foster-parents. It has occurred to me that perhaps the kind of food, partially digested by the parent canary birds, and then regurgitated and fed to their young, would have militated against the growth and development of another kind of bird. However, in the case of three cowbird's eggs upon which I have experimented, all of which were hatched, this should not have prejudiced their growth, when we consider the variety of foster-parents that are induced to hatch and rear the eggs and young of the cowbird.

To briefly summarize the work I have described in some detail, forty-one different eggs of wild birds, representing six species, and three young birds already hatched, form the aggregate of individuals dealt with. All of the forty-one eggs were fertile, and were hatched by the foster-parents. This is suggestive in regard to the propagating powers of wild birds, and though not conclusive, indicates a much higher percentage of fertility in the eggs laid by them than obtains in song birds when caged, or semi-domesticated. None of the young which were hatched from these eggs reached a greater age than seven days, which would seem to indicate that the food supplied by the foster-parents, which was the same on which they raised their own offspring, was of a kind so different from that used by wild birds in rearing their young, that it proved inadequate. I also believe that the nest lining was of a character so unlike that of the nests natural to the foster-chicks, that it prejudiced their development and growth.

In the light of the knowledge I have gained I shall endeavor, in the coming breeding season, to conduct further experiments of a similar character, and hope for better results. It seems worthy of note that I have been able to rear not only all the kinds of birds mentioned by hand, but in addition some twenty other species of song birds. These birds have been taken from their parents' care at ages varying from three to six or seven days, and over ninety per cent. have been successfully reared, being fed by hand. Such birds in most cases have not only reached maturity, but many of them have lived from three to seven years.

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Notes on Polyodon, I.

While engaged last summer on the upper Mississippi in investigating the natural history of the spoonbill (*Polyodon spathula*) I had occasion to examine a great many specimens, caught by the fishermen in a five-hundred-yard seine. My attention was soon called to the presence of a pair of minute barbels some distance in front of the mouth. Not recalling any reference to these in the literature on *Polyodon,* I examined a great many specimens and invariably found them present. A further examination of the literature shows that among systematists these barbels have been entirely overlooked, although the ordinarily recognized affinities of the fish to the

sturgeons would cause one to look for them especially. So Jordan and Evermann (Bulletin 47, U. S. N. M., Pt. 1, p. 101), in their characterization of the Polyodontidæ, say definitely, 'no barbels.' Only within the last few weeks I have discovered what is seemingly the only reference to these barbels, in a paper by Mr. Edwards Phelps Allis, Jr. (*Zoologische Jahrbücher*, Abth. für Anatomie, etc., Vol. 17, p. 671).

In a specimen of *Polyodon* 85 cm. long, these barbels lie 47 mm. in front of the mouth, on the ventral surface of the 'paddle.' They are 23 mm. apart, and the right one measures 3.5 mm. in length. The left one is considerably shorter, and in general there is considerable difference in their size in different individuals. They are very slender, nearly colorless, and translucent. It seems doubtful whether they are functional.

The fact that these barbels have not heretofore been noticed even by our best systematists suggests the idea that they may not be present in specimens from other regions. As to this point I hope to gather evidence next summer, in connection with other researches on *Polyodon*.

Another interesting point concerning *Polyodon* is the occurrence of peculiar small true scales over the surface lying over the entire scapular arch and extending forward the entire length of the isthmus. They thus form a barrier that must be crossed to enter the branchial region from behind. As this entire region is well covered over by the large opercular flaps and gular pouch, it was at first very difficult to see any significance in such an arrangement. But a few observations in the field soon disclosed the meaning. *Polyodon* is preyed upon, more than any other fish I know of, by the lampreys. To find from ten to fifteen of them attached to one paddlefish is not uncommon, and there is scarcely an individual that bears no scars. Once or twice I observed the lampreys had worked their way under the opercular flaps. Now these, if they worked further forward would encounter the band of scales which would undoubtedly stop them, to judge from their avoidance of scaled areas on other fishes. An examination, however, shows that just inside of this band lies the great branchial artery, but little below the surface. It is evident, therefore, that this band of scales is an important adaptation for the protection of this vital region against attack from so fearful an enemy as the lamprey.

GEORGE WAGNER.

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February 22, 1904.

CURRENT NOTES ON METEOROLOGY.

CLIMATE OF THE PHILIPPINES.

IN an article by Gannett on 'The Philippine Islands and Their People,' published in the *National Geographic Magazine* for March, there are some notes on Philippine climate. The mean annual temperatures are not far from 80°, the range between the mean temperatures of the warmest and coldest months at Manila being but 7°. Temperatures of 100° are almost unknown. The lowest temperature on record is 60°. The diurnal range near the seacoast rarely exceeds 15°, and the mean for the year is only 11°. The relative humidity is always high, being usually at least 75 per cent. From November to June the northeast trade, and from July to October the southwest monsoon, is the prevailing wind. Rainfall is much heavier on the windward than on the leeward sides of the mountains. In most parts of the islands the northeast trade wind gives the dry season, and the southwest monsoon brings the rains. The mean annual rainfall varies between 40 and more than 100 inches. At Manila, four fifths of the annual rainfall comes between the first of July and the end of October. Then the streets are flooded, the air is saturated, and things are covered with mould.

CONDITIONS OF ATMOSPHERE DURING FOGS.

IN *Das Wetter* for January, Elias discusses the conditions of the lower air during fogs, as shown by kite observations at the Aeronautical Observatory near Berlin during the years 1901–2. The results are plotted to show the variations in temperature, humidity and wind with altitude. The most striking fact is that

an increase of temperature with altitude during fog is an exception, and is observed only at the beginning of fog formation, or during very light ground fogs. The usual condition is a decrease of temperature, and occasionally a very rapid decrease.

NOTES.

A PAPER by Sir J. Norman Lockyer, on 'Simultaneous Solar and Terrestrial Changes,' read before the Southport meeting of the International Meteorological Committee (September, 1903), is published in *Nature* for February 11. In this paper Lockyer reviews the work done along similar lines by previous investigators, and gives the results of his own studies, to which reference has already been made in these Notes.

Smithsonian Miscellaneous Collections, Quarterly Issue, July–September, 1903, contains 'Recent Studies of the Solar Constant of Radiation,' by C. G. Abbot.

R. DEC. WARD.

THE PELÉE CLUB.

THE PELÉE CLUB held its second annual meeting at the New Willard Hotel, Washington, D. C., February 27.

This unique organization is composed of men who participated in the events connected with the relief, scientific and news-gathering expeditions to Martinique and St. Vincent. Its original membership embraces about eighty people, including officers of the navy and army, geologists, journalists and magazine writers.

While the club was originally organized to perpetuate the associations and friendships formed during the exciting moments of the Martinique incident, at its first annual meeting it was resolved to make the organization of permanent value to mankind by taking upon itself the function of collecting, as nearly as possible, a complete record of the events of the recent Martinique eruption, and by publishing them in a composite volume, which is well under way.

The society also undertook the collection of all photographs pertaining to the eruptions and relief expeditions, and this has resulted in a collection of nearly two thousand negatives by Professor E. O. Hovey, chairman of the committee on photographs. The society has made the New York Museum of Natural History (the only American institution, except the National Geographic Society, which has exhibited serious interest in the West Indies) the permanent repository for its collection of photographs and records.

Having progressed thus far, the society at its recent meeting still further expanded its functions. Realizing that the subject of volcanic geography in its widest sense, including all branches of interest pertaining to volcanic countries and phenomena, is a wide and unorganized field of cooperative study, the society has resolved to widen its sphere of usefulness by taking up this subject and becoming a permanent organization for its study. Accordingly it resolved to use the present organization as a nucleus for the expansion of the association, to adopt a permanent organization and to expand the membership by taking into the society all investigators interested in the subject of volcanoes.

When the importance of vulcanism in relation to the environment of man, the part it plays in the structure of the earth, and how little is done to systematically study these subjects, is considered, it is evident that the Pelée Club has before it a most interesting and useful study. The character of its membership is unusually favorable for its successful operation, and it is believed that it will especially stimulate interest in the recording of the important geographic observations of the large number of intelligent observers in the army, navy and journalistic circles, while the purely scientific element is also large and influential.

The society has also resolved to use its influence for the encouragement of local organizations wherever they may be and accept as an affiliated society the unique Club Montagne of Guadeloupe, which in the out-of-the-way island of that name has provided an organization for the study of the Grand Soufrière, the highest and most dangerous-looking volcano of the West Indies, and which, at its own expense, has constructed a road to the summit and made arrangements to guide and enter-

tain all earnest students who wish to visit this remarkable volcano. Similar local organizations will be encouraged in the Philippines, South America, Mexico and other volcanic countries, where, by a little encouragement, local observation will be stimulated.

The committee on permanent organization consists of Capt. T. C. McLean, Commander of the League Island Navy Yard, Philadelphia; Professor I. C. Russell, of the University of Michigan; Lieut. Com. J. B. Bernadou, of the U. S. Navy; Major H. J. Gallagher, of the U. S. Army; Professor E. O. Hovey, of the American Museum of Natural History; Professor T. A. Jaggar, of Harvard; Messrs. A. F. Jacacci and George Kennan, the well-known writers, and Messrs, J. Martin Miller, W. M. Mason and J. O. Hammitt, of the press.

The president of the society is Mr. Robert T. Hill, the secretary, Mr. H. H. Smith, and its address is Washington, D. C.

PRESIDENT ELIOT.

THE following letter with some ten thousand signatures was presented to President Eliot on his seventieth birthday.

March 20, 1904.

Dear Mr. President: As with undiminshed power you pass the age of seventy, we greet you.

Thirty-five years ago you were called to be president of Harvard College. At the age of thirty-five you became the head of an institution whose history was long, whose traditions were firm, and whose leading counselors were of twice your age. With prophetic insight you anticipated the movements of thought and life; your face was towards the coming day. In your imagination the college was already the university.

You have upheld the old studies and uplifted the new. You have given a new definition to a liberal education. The university has become the expression of the highest intellectual forces of the present as well as of the past.

You have held from the first that teacher and student alike grow strong through freedom. Working eagerly with you and for you are men whose beliefs, whether in education or in religion, differ widely from your own, yet who know that in speaking out their beliefs they are not more loyal to themselves than to you. By your faith in a young man's use of intellectual and spiritual freedom you have given new dignity to the life of the college student.

The universities and colleges throughout the land, though some are slow to accept your principles and adopt your methods, all feel your power and recognize with gratitude your stimulating influence and your leadership.

Through you the American people have begun to see that a university is not a cloister for the recluse, but an expression of all that is best in the nation's thought and character. From Harvard University men go into every part of our national life. To Harvard University come from the common schools, through paths that have been broadened by your work, the youth who have the capacity and the will to profit by her teaching. Your influence is felt in the councils of the teachers and in the education of the youngest child.

As a son of New England you have sustained the traditions of her patriots and scholars. By precept and example you have taught that the first duty of every citizen is to his country. In public life you have been independent and outspoken; in private life you have stood for simplicity. In the great and bewildering conflict of economic and social questions you have with clear head and firm voice spoken for the fundamental principles of democracy and the liberties of the people.

More precious to the sons of Harvard than your service as educator or citizen is your character. Your outward reserve has concealed a heart more tender than you have trusted yourself to reveal. Defeat of your cherished plans has disclosed your patience and magnanimity and your willingness to bide your time.

Fearless, just, and wise, of deep and simple faith, serene in affliction, self-restrained in success, unsuspected by any man of self interest, you command the admiration of all men and the gratitude and loyalty of the sons of Harvard.

SCIENTIFIC NOTES AND NEWS.

THE annual stated session of the National Academy of Sciences will be held in Washington, D. C., beginning on Tuesday, April 19, 1904.

To celebrate President Eliot's seventieth birthday, Harvard graduates and students have subscribed $5,000 for a portrait or bust to be placed in the Union.

DR. S. P. LANGLEY, secretary of the Smithsonian Institution, has been made a corre-

sponding member of the Reale Istituto Veneto.

Professors Joschikijo Koganei and Tsuboi, of the University of Tokyo, have been made corresponding members of the German Anthropological Society.

Dr. J. H. van't Hoff, the eminent chemist, has been made an honorary doctor of medicine by the University of Utrecht.

Dr. Heinrich Caro, of Mannheim, who celebrated his seventieth birthday on February 13, has been given the honorary doctorate of engineering by the Technical School at Darmstadt, in view of his contributions to chemical science and industry.

Professor F. L. Knapp, formerly professor of technical chemistry at the Technical School of Brunswick, has recently celebrated his ninetieth birthday.

At the request of the Peruvian government, the U. S. Geological Survey has sent Dr. George I. Adams to Peru to organize a service for hydrographic work.

Dr. N. L. Britton, Mrs. E. G. Britton and Dr. M. A. Howe, of the New York Botanical Garden, are now engaged in a collecting expedition in Florida and in the Bahamas, using Miami as a base of operations.

Dr. D. T. MacDougal has returned from Sonora and Baja California, where he recently carried out some explorations. In addition to the observations and collections of vegetation valuable data concerning temperatures and relative humidity were obtained.

Dr. Arthur Hollick has obtained leave of absence from the New York Botanical Garden in order to examine and report upon a collection of fossil plants representing the Cretaceous (Island series) flora of Staten Island, Long Island, Block Island and Martha's Vineyard for the U. S. Geological Survey.

Dr. James Ward, professor of philosophy at Cambridge, will lecture before the summer school of the University of California. He will be one of the speakers before the Congress of Arts and Science of St. Louis, and will subsequently visit some of the eastern universities.

Professor Maragliano, of Genoa, was unable, owing to illness, to come to this country and give the lecture on tuberculosis before the Phipps Institute of Philadelphia, which had been announced for March 28.

Mr. Overton W. Price, of the Bureau of Forestry, has been appointed lecturer in the Forest School of Yale University.

Mr. Stewart Culin, of the Brooklyn Institute, on March 24, gave in the Fogg lecture-room of Harvard University the first of a series of three lectures arranged by the Anthropological Club, speaking on 'Recent Anthropological Investigations in the Southwest.' On April 12, Professor A. F. Chamberlain, of Clark University, will speak on 'What Our Civilization owes to the American Indian'; and shortly after the spring recess Mr. H. I. Smith, of the American Museum of Natural History, New York, will give an address on 'Recent Anthropological Investigations on the Northwest Coast of America.'

It is announced that the following have consented to lecture before the Carnegie Technical School at Pittsburg: Professor C. L. Mees, president, Rose Polytechnic School, Terre Haute, Ind.; Miss Helen Kinne, Teachers College, Columbia University, New York; Harriet Sackett, Pratt Institute, Brooklyn; Professor Warren P. Laird, University of Pennsylvania, Philadelphia; Professor W. T. Goldsborough, Purdue University, Lafayette, Ind.; Professor W. F. Durand, Cornell University, Ithaca, N. Y.; Professor C. F. Binns, Alfred University, Alfred, N. Y.; Professor Robert H. Richards, professor of mining and metallurgy, Massachusetts Institute of Technology, Boston; Professor James Russell, dean of Teachers College, Columbia University, New York City; H. H. Moek, mines and minerals, Scranton, Pa.; William E. Gibbs, consulting engineer, New York, and Professor C. F. Chandler, Columbia University, New York.

We have noted the death of the well-known zoologist, Professor Fredrik Adam Smitt, which took place at Stockholm on February 19. Born on the ninth of May, 1839, at Halmstad, he took his doctor's degree at Upsala in 1863, and became docent in zoology at that uni-

versity. While in this position he joined Torell and Nordenskiöld in their expedition to Spitzbergen in 1861, went with Nordenskiöld's expedition to Beeren Island and Spitzbergen in 1868 and accompanied the frigate *Josefine* on her voyage to the Azores, England and North America in 1869. On the death of Professor Sundevall in 1871 Smitt, though only thirty-two years old, was appointed to succeed him as professor and intendant at the Natural History Museum of the state. Smitt wrote several papers on marine invertebrates, notably bryoza, but it was for his work on fish that he was best known, especially his critical list of the Salmonidæ in the state museum. Of late years he had paid much attention to the gobies. His scientific knowledge was freely bestowed in attempts to help the Swedish fisheries.

DR. KARL SCHUMANN, titular professor of botany at Berlin and curator of the Royal Botanical Museum, well known for his contributions to our knowledge of flowering plants, has died at the age of about fifty years.

WE regret also to record the death of Henry Perrotin, director of the Observatory at Nice at the age of fifty-eight years; of Dr. W. W. Markownikow, professor of chemistry in the University of Moscow; of Dr. Hermann Emminghaus, formerly professor of psychiatry at Freiburg, at the age of fifty-nine years, and of Dr. L. Beushausen, docent of paleontology at the Berlin School of Mines, at the age of forty-one years.

THE French Association for the Advancement of Science will hold its annual meeting at Grenoble beginning on August 4, 1904, under the presidency of M. C. A. Laisant.

THE following have been elected as an organization committee of the American Bibliographical Society: *Chairman*—Worthington C. Ford, Library of Congress, Washington, D. C.. *Secretary-treasurer*—George W. Cole, New York City; Wilberforce Eames, Lenox Library; A. G. S. Josephson, John Crerar Library; Azariah S. Root, Oberlin College Library.

ON April 19, there will be an examination for the position of scientific assistant, qualified in library science in the Bureau of Chemistry, at a salary of $840. There will also be held on April 19 an examination for computors and for aid and deck officers in the Coast and Geodetic Survey. On April 19 and 20, there will be an examination for the position of librarian in the U. S. Coast and Geodetic Survey, at a salary of $1,800. Further information in regard to these examinations can be obtained from the Civil Service Commission, Washington, D. C.

BILLS have been introduced into the Senate and the House of Representatives incorporating the Carnegie Institution of Washington.

ACTIVE preparations are being made at the New York Zoological Garden in Bronx Park for taking the animals out of winter quarters. Work is also being pushed with all possible speed on several new houses in the garden, the most important of which are the bird house, to cost $115,000; the small mammal house, to cost $38,000, and the ostrich house, to cost about the same sum.

Two physicians of the Hamburg Institute for Tropical Diseases—Drs. Otto and Neumann—have gone to South America for the purpose of studying yellow fever. They are supplied with considerable means furnished by shippers and merchants of Hamburg. In addition to scientific studies they are to collect information with reference to the new preventive measures now used in South America against yellow fever, and to devise means to prevent the heavy damages which the German merchant marine has suffered in the several years of yellow-fever epidemics.

MR. HENRY GANNETT, geographer of the United States Geological Survey, has recently received numerous letters of inquiry regarding the proper spelling of the place names in Korea and Manchuria that have become prominent. Mr. Gannett suggests that the matter would be much simplified if it were generally known that a system of transliteration of such names has been adopted by most European nations, by Canada and by this country. This plan is published in the Second Report of the United States Board on Geographic Names. The rules adopted by

the Board on Geographic Names provide that the vowels shall have the sounds that are common to the vowels in the languages of southern Europe. It follows, therefore, that *u* has the sound of *oo* in boot and that Manchuria is therefore preferred to Manchooria, Chefu to Chefoo, Amur to Amoor. It has been ruled that *ai* has the sound of *i* in ice; *au* the sound of *ow* in how (*ao*—a very frequent combination in the East, heard in names like Mindadao and Nanao—is slightly different from the preceding); *ei*, as in Beirut, has the sound of the two Italian vowels, but is frequently slurred, when it is scarcely distinguishable from *ey* in the English word they. In accordance with the rules, *c* is always 'soft,' having the sound of *s*. 'Hard' *c* is represented by *k*, and it therefore follows that Korea is the accepted form, and not Corea. Other rules are that *ch* is always 'soft,' as in church; *f* is sounded as in English and *ph* should not be used to represent this sound; *g* is always 'hard,' as in get; *h* is always pronounced; *j* and *k* have the English sound; *kh* has the sound of the oriental guttural; *gh* is another guttural; *ng* represents in different words different sounds—two sounds, as in finger, and one, as in singer; *q* should never be employed for the sound of *qu*, which is represented by *kw*, as in Kwantung; *y* is always a consonant, as in yard.

The Boston Society of Natural History has undertaken to publish a series of lists of New England animals to form a volume of its Occasional Papers. These lists will be issued at irregular intervals, and are considered a necessary preliminary to more exhaustive monographs on New England animals, the publication of which the society hopes at some future time to undertake. To facilitate the preparation of these catalogues, the cooperation of persons interested in the fauna of New England is invited. Any New England specimens for the society's museum should be sent to Mr. Charles W. Johnson, curator, and all notes, records, etc., to Mr. Samuel Henshaw, editor of 'New England Fauna,' in care of the society, Boston. The first two parts of the projected volume, containing lists of the Reptilia and Amphibia, are now in press.

UNIVERSITY AND EDUCATIONAL NEWS.

Sir William McDonald will give $100,000 to McGill University to establish a students' union hall.

The Chicago Board of Education proposes to build, at a cost of $500,000, a commercial high school on the lake front.

Our consul at Bahia writes that the state of Bahia is about to organize a school of mines and wishes to arrange for a competent professor of mining. The state will make a contract for three years to pay the equivalent of from $3,000 to $4,000 a year as salary, with free transportation. It will be necessary that the applicant be a graduate of some recognized American school of mines and that he have both a practical and theoretical knowledge of mining. A speaking knowledge of Portuguese or Spanish is preferred, but lack of such will be no bar to a good man. Applications should be addressed to Dr. Miguel Calmon du Pin e Almeida, Secretario da Agricultura, Industria, etc., Bahia, Brazil, or may be sent to the consulate for delivery.

The report of the members of Mr. Moseley's education commission to the United States will be published on April 9. It will contain about 600 pages and will be published at the nominal price of one shilling.

Examinations for the Cecil Rhodes scholarship at Oxford will be held in the various states on April 13.

Mr. Alexander Smith has been made professor of chemistry and director of general and physical chemistry at the University of Chicago.

Dr. Max Mason, of the Massachusetts Institute of Technology, has been appointed instructor of mathematics in Yale University.

Dr. Karl Wernicke, professor of psychiatry at Breslau, has been called to Halle to fill the chair vacant by the removal of Professor Th. Ziehen to Berlin.

Dr. K. S. Semström, professor of physics at the University of Helsingfors, has retired from active service.